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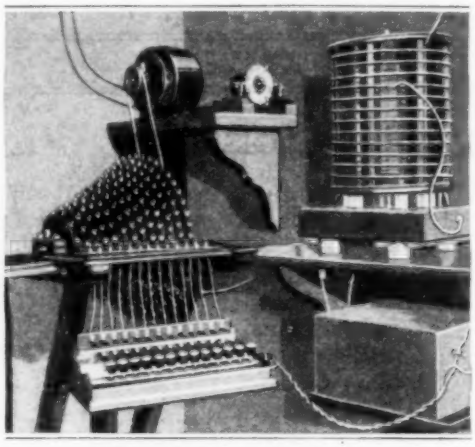
Electric Organ Transmits Wireless Music

A WIRELESS-TELEGRAPH musical instrument that opens up a field in which there are many interesting possibilities, has been patented in this country by a resident of eastern Canada. This new mechanism plays musical notes and transmits them to any ordinary wireless receiving instrument. It is based on the principle that wireless sparks discharged in rapid succession produce a musical note, the pitch of which depends on the rapidity with which the sparks are discharged. To apply this principle, a series of annular rows of points, or electrical poles, with proper connections, are attached to a rotor composed of a series of disks each larger or smaller than the ones adjoining it. The poles are all set the same distance apart so that when the rotor is revolved more poles at the large end will pass a given line than will pass the line at the small end, in the same space of time.

Connected with the rotor is a keyboard having keys and poles corresponding to each disk. By pressing one of the keys while the rotor is re-

Wireless-Telegraph Organ Which Transmits Music to Ordinary Wireless Receiving Instruments

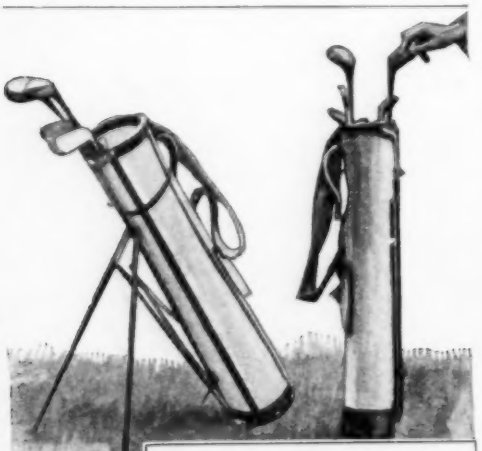
volving, a series of sparks are produced between its pole and the rapidly passing poles on the rotor. The number of studs on each disk is in such proportion to the adjoining disks that each row produces a tone one note higher than the smaller disk adjoining it. Tones an octave higher are produced by revolving the same, or preferably a similar, rotor at twice the speed producing the normal tone, and similarly all semitones, or flats, are produced by revolving a rotor one-twentieth slower than the speed of the normal tone. The full development of the invention calls for an organ having a number of rotors connected with a large keyboard, these rotors to be so geared that they will produce all the notes of a regular organ. An instrument with a rotor having 13 disks has already been built by the inventor. It is played much like an ordinary organ, pianissimo and fortissimo being secured by means of a pedal attached to a rheostat so that the volume can be increased and decreased by changing the strength of the current.



A Simple Model of the Wireless Organ, with Its Motor and Keyboard: With This Apparatus 13 Musical Notes can be Produced

SIMPLE ATTACHMENT HOLDS GOLF BAG UPRIGHT

A convenient support which can be easily attached to any golf bag is now being used by players who employ a caddy as well as those who do not. The device is inconspicuous and opens and closes automatically. It consists of an extensible rod to which are hinged two metal legs that normally are folded up against the rod through the operation of springs. The support is quickly attached to a bag by means of plates fastened to the top and bottom of the receptacle. A striking plate which projects slightly below the lower end of the container serves to open up the legs when the player rests the bag on the ground. So opened, they are in a position to keep the clubs and their holder from falling over. The attachment saves stooping over for one's sticks and keeps them out of the dirt or moisture. It can be quickly detached.



A Support Which Holds a Golf Bag Upright and Folds Up Automatically When the Bag is being Carried

¶For the purpose of making a simultaneous test in Chicago, Pittsburgh, St. Louis, and Cincinnati to determine which is the smokiest city, open jars have been set in sheltered outdoor spaces in each municipality to accumulate the soot. Their contents are collected, weighed, and analyzed monthly.

TOURIST ACCOMMODATIONS ON THE FRENCH BATTLE FRONT

AN American, recently returned from relief work in Belgium and northern France, said that he had not a shadow of a doubt that, in the course of the next ten years, the tourist of the world will have left more than enough money in the war-devastated regions to pay for all the damage done there by the Germans.

"If the short-sighted Teuton could have looked ahead," said this gentleman, "he might have thought twice before establishing a battle front in France and Flanders which, for perhaps uncounted centuries to come, will bring more money into those countries every year than would a hundred Oberammergau Passion plays—boarding-house rights and moving-picture concessions included—running all the time. Once the Germans found they could not go to Paris and crush France, it would probably have paid them better, in the long run, if they had fallen back and established the great battle line in some region that was reasonably certain to remain under the red, white, and black standard of the double-headed eagle after the war was over."

Though spoken somewhat in jest, these words are almost literally true. France, even during the stress of war economy and without any prodigal American or other tourists, has found the battle field of the Marne a veritable gold mine, and that the blood-hallowed ground of the present battle front is going to prove an incalculable asset—even in cold francs and centimes—for years and years to come, there can be no question whatever.

The same gentleman quoted above is authority for the statement that the thrifty French of the shell-shattered towns of the war zone are already taking serious account of the tourist trade of the future in connection with their plans for rebuilding after the war. "In one half-destroyed village of a district where I was looking after the distribution of food," he said, "the handful of inhabitants remaining have formulated a plan for turning several of their worst damaged blocks into a 'Boche' memorial, a sort of 'Lest We Forget' monument to serve, in the first place, as a perennial reminder of what they had suffered at the hands of the Germans, and, in the second place, as something for the visitors to see." Those of another village have decided to preserve the shell-pierced tower of their little church for similar reasons.

To Accommodate the Thousands of Tourists Who will Visit the Western War Zone When Peace is Declared, a French Company is Preparing to Establish Temporary Cottages and Hotels on What Are Now the Battle Lines of Northern France. The Artist's Drawing Illustrates the Idea as Planned at Present

Many stretches of trenches, both inside and outside of villages, will also be kept, partly as memorials, partly to awaken the sympathy and interest of the visitors of the years to come.

A French company has been formed which is now making plans for the establishment of temporary houses and hotels on the present battle front, which, of course, is at present entirely without facilities for receiving the army of visitors which, it is felt sure, will pour in when the belligerents lay aside their arms. Negotiations are being carried on with American manufacturers for the construction of portable one-story dwellings and hostelries. Plans, specifications, and prices have been requested for structures of different types ranging from one, two, and three-room houses to community, or hotel, buildings having from 25 to 200 rooms, in addition to kitchens and dining halls. These are to be of a comfortable, neat, but inexpensive type, and supplied completely furnished. The company anticipates expending about $1,000,000 for the buildings, which, it is planned, will be set up at various points of interest along a line extending from the shores of the English Channel to Switzerland. While the proposition is still in its preliminary stages, the company announces that guests will be accommodated at its hotels for about $3 a day, this moderate price including meals.

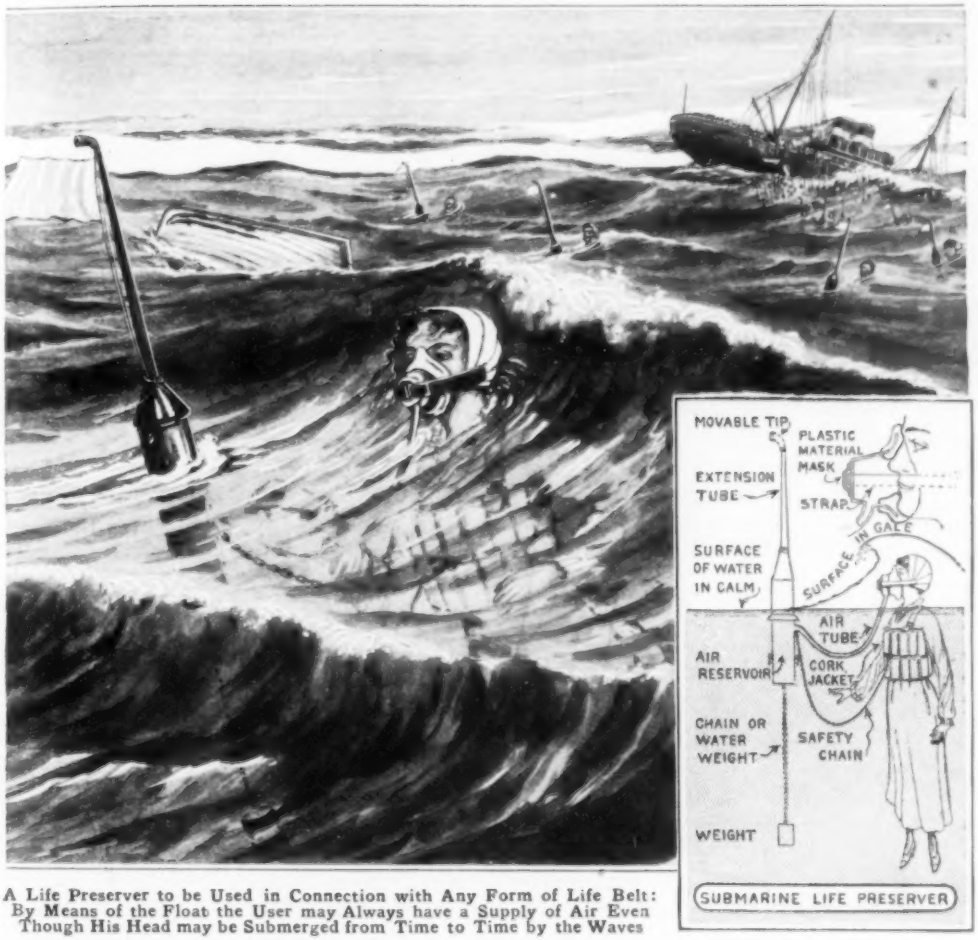
Parties who prefer the privacy of the home to residence in the community buildings will be able to lease the small portable cottages, which will be equipped ready for occupancy.

A brisk trade in fragments of shell, shrapnel bullets, bent bayonets, broken rifles, and other war relics, has already sprung up in the rear of the French and British lines, and so far the supply —on the ground—has kept well abreast of the demand. Until the war is over the soldiers themselves will be the principal collectors, and as a consequence of the contempt bred in "Tommy" and "poilu" by familiarity with high explosives, a number of post offices in both France and England have been more or less seriously damaged by the bursting of "unexploded" shells and hand grenades sent by parcel post from the front to friends at home. One of these harmless war relics, which had somehow managed to survive the rough handling of the postal service, reached its destination—a small country town in the north of England—only to explode, with serious consequences, while being playfully tossed about among the guests at a lawn fête being given as a Red Cross benefit.

In spite of the rapidity with which the genuine article is being turned out at the front, the fact that palpably faked relics are already being offered in Paris and London seems to indicate that when Europe again becomes the playground of the world—the Mecca of the idle, the curious, the gullible—there will be a new and lucrative industry added to those already existing before the war. The manufacture of imitation war relics bids fair to be carried on upon a scale that will dwarf the manufacture of old masters and Egyptian scarabs as the present mighty struggle dwarfs all other wars of history.

LIFE PRESERVER SUPPLIES AIR AND WATER TO USER

A life preserver, by means of which the user may always have fresh air to breathe and by which he can signal for help, has been devised by a Buffalo inventor who has had success in inventing other life-saving appliances. It is also possible to have a limited supply of drinking water and food connected with this preserver. The apparatus is intended to supplement and be used in connection with the cork jackets or other belts found on practically all vessels. It is composed of three essential parts: a face mask of metal and some plastic material by which, with the aid of a head strap, the mask can be fitted close about the nose and mouth; an air-supply float which somewhat resembles an enlarged oilcan, having a tapering point that extends three or four feet above the water, and a tube connecting the face



A Life Preserver to be Used in Connection with Any Form of Life Belt: By Means of the Float the User may Always have a Supply of Air Even Though His Head may be Submerged from Time to Time by the Waves

mask with this float. Attached to the lower end of the latter, or incorporated in it, is a weight to keep the float upright in the water. One type of these preservers compactly houses several of its parts in the float.

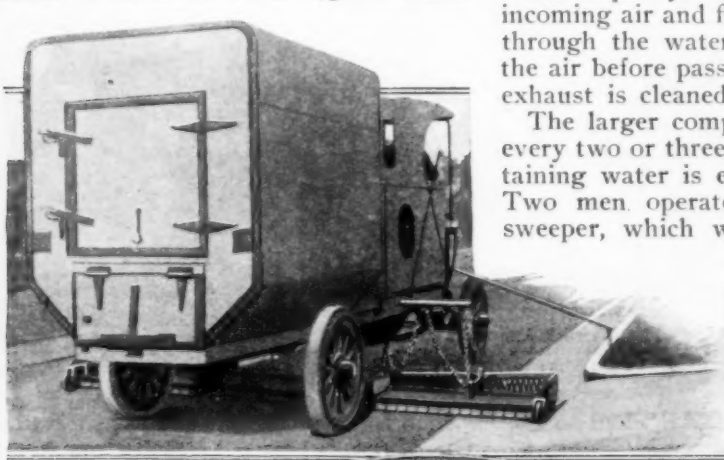
A person equipped with one of these outfits would be able to breathe regardless of the waves that broke over him, because the float would always keep upright and take in little if any water. A revolvable rubber tube, slightly bent to one side, aids in keeping the water out of the float because the action of the wind and water tends to turn its opening away from the approaching waves. The weight suspended from the lower end of the float may be made with compartments in which fresh water may be kept for the use of the distressed person from time to time. The mask is so constructed that when one's head is above water fresh air can be breathed in by withdrawing the chin from the plastic mold in which it normally rests. With the aid of one or both hands one can take a drink of water without entirely removing the mask. The supply float is so constructed that if it becomes filled with water it will not sink; the user can expel the water by tipping it over on its side and blowing into the air tube. It is possible so to alter the construction of these floats that they can carry a little food, or to supplement them with floats designed especially to carry food. By allowing a certain amount of

water to enter the air tube the inhaling and exhaling of air by the user produces a peculiar gurgling sound that is designed to serve as a distress signal and, because of the nature of the construction, can be heard some distance. Ordinarily a small amount of water in the air tube will not seriously hinder the breathing.

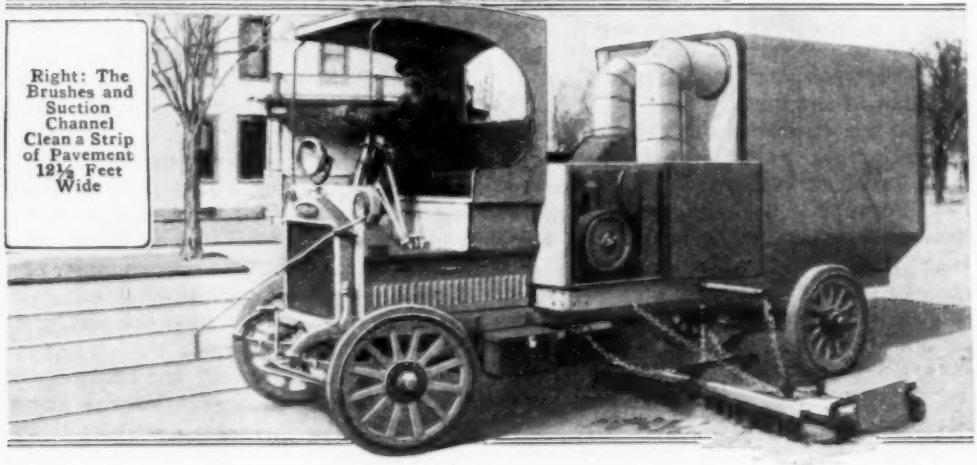
MOTOR VACUUM CLEANER FOR CITY STREETS

A vacuum street cleaner, the operation of which is much more sanitary than ordinary street sweeping because it raises practically no dust, is now in use in Pasadena, Cal., and Oklahoma City, Okla., and is being tried in several other cities. The sweeping apparatus is mounted on a 1½-ton truck and is operated by a 20-hp. motor; both the truck engine and the sweeper engine burn distillate. Extending transversely beneath the center of the car is a framework, 12½ ft. long, divided into three sections and supported by chains by which the operator can raise or lower it when desired. The forward part of the framework supports brushes which loosen the dirt as they move along; immediately back of them is the suction channel, through which the refuse is drawn up by way of a common tube into an air-tight receptacle having 3-cu.-yd. capacity and mounted on the rear of the truck. It is divided into two chambers, the first of which catches the coarser sweepings. The dust and finer particles are carried on by the suction into the lower chamber, which is partly filled with water. The incoming air and fine refuse are forced through the water by baffles, and so the air before passing out through the exhaust is cleaned.

The larger compartment is emptied every two or three hours; the one containing water is emptied once a day. Two men operate the machine and sweeper, which will cover a 12½-ft.



Left: Rear View of Street Vacuum Cleaner Showing Air-Tight Chamber into Which All Dirt is Drawn

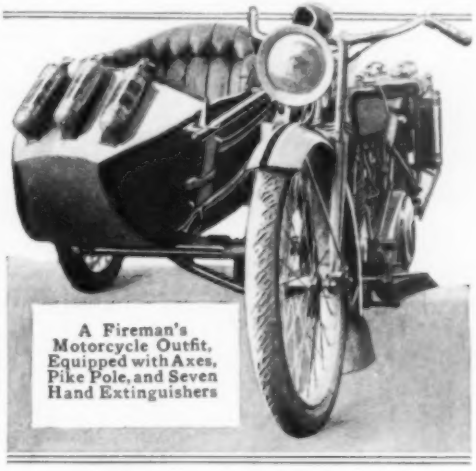


Right: The Brushes and Suction Channel Clean a Strip of Pavement 12½ Feet Wide

strip 28 miles long in eight hours, in which time the two engines will consume 15 gal. of distillate. Several cities use vacuum sweepers of this type, mounted on horse-drawn vehicles.

FIREMAN'S MOTORCYCLE HAS EXTINGUISHERS AND AXES

A fire-fighting outfit has been placed on the market by a motorcycle concern which consists of a motorcycle and sidecar equipped with seven chemical fire extinguishers, two firemen's axes, and a regulation pike pole. The extinguishers are fastened on the front of the sidecar and the rear of the motorcycle within easy reach. The axes and pike pole rest in racks between the motorcycle and the attached body. This outfit is designed to enable two firemen to reach the scene of alarm some minutes in advance of the rest of the fire company, which must necessarily be subjected to more delay. A saving of a few minutes' time not infrequently results in securing control of a blaze before it has done serious damage.



A Fireman's Motorcycle Outfit, Equipped with Axes, Pike Pole, and Seven Hand Extinguishers

LIMESTONE QUARRIES ARE DEEP AND DANGEROUS

A limestone quarry which is about a mile long, picturesque in appearance, and dangerous to work in is located near Rockland, Me. There 300 laborers, chiefly foreigners, toil in chasms having perpendicular sides 500 ft. high and no way of entrance or egress except by means of the derricks which hoist and lower about a dozen men at a time. Approximately 1,000,000 bbl. of lime are prepared in the vicinity of Rockland annually. Dynamite is used by the workmen in blasting the rock preparatory to hoisting it to the surface. After a blast has been discharged and the loosened mass broken up enough so that it can be handled, it is loaded onto drags. These are the same rectangular, shallow containers in which the workers descend into the quarry. After the proper signal has been given, the load is hoisted to the top by a derrick and deposited in a train of especially constructed cars. The train is hauled to a number of kilns which line the water front, where by means of trestles the cars are brought above the kilns and emptied into them without additional handling of the rock.

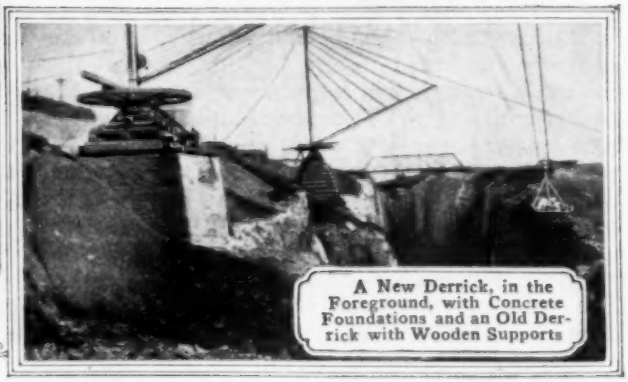
These kilns consist of large steel tanks, open at the top and having iron gratings at the bottom, under which are the fire boxes. Formerly logs were used for fuel, and it required five days to burn the rock, but now coal is used, the fires being forced by a powerful steam blast, and the burning is completed in three days. The rock as it comes from the quarries is bluish gray; when it is drawn from the kilns it is creamy white. After being drawn, it is allowed to cool, and then is sorted in wooden casks and loaded onto ocean barges. One large building is devoted to the manufacture of lime pencils made of the best quality of lime, which is set aside for this purpose during the sorting. This lime is crushed into a powder, mixed with paste, and then pressed in molds. These pencils are used in connection with oxyhydrogen spot lights. The men employed in this branch of the work are compelled to

Laborers Just Lifted from Quarry by a Derrick and About to be Deposited on Landing Station

Barrel Burst by Lime Which has Accidentally Become Wet

Near View of Men at Work in One of the Quarries. The Pool of Water Shown beyond the Laborers Is 200 Feet below Their Level

Some of the Quarries near Rockland, Maine, Are 500 Feet Deep and cannot be Entered except with the Aid of a Derrick



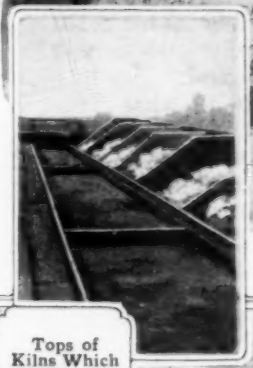
A New Derrick, in the Foreground, with Concrete Foundations and an Old Derrick with Wooden Supports

Workman's Mask for Protection against Lime Dust

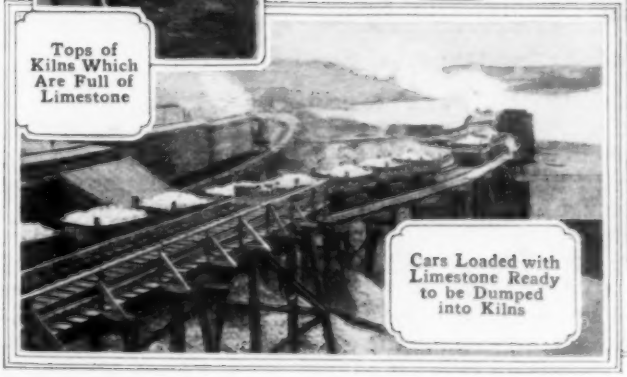
Quarry Workmen being Lowered in Their Respective Derricks

Derricks on Quarry's Brink: Cable Supplies Power to Water-Pumping Station Down in Chasm

The Quarry's Sides Are Perpendicular and, despite Precautions, Rocks Sometimes Fall and Strike Workmen



Tops of Kilns Which Are Full of Limestone



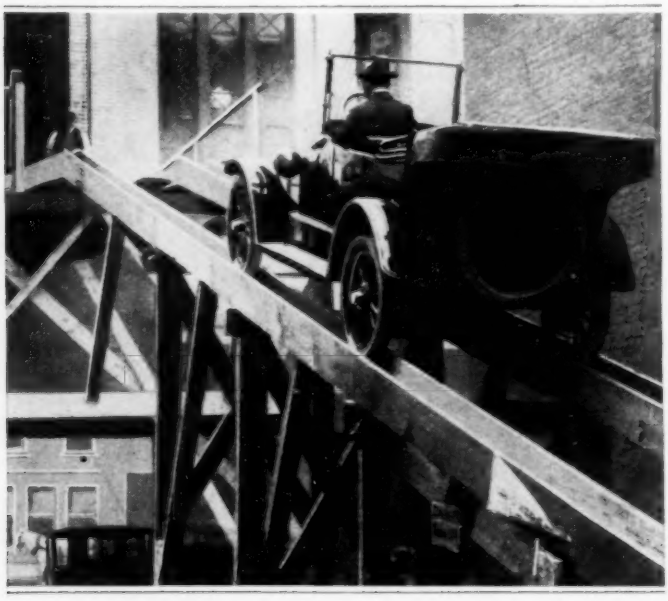
Cars Loaded with Limestone Ready to be Dumped into Kilns

wear masks and otherwise protect themselves from the penetrating fumes.

Rock and dirt, falling from the sides of the chasms from which the limestone is taken, are a constant source of danger to those working below. Blasting, frosts, and the rains aid in loosening overhanging fragments. To minimize this danger what is called "cleaning the bluffs" is undertaken when no one is at work in the quarries. One man, holding a cable and standing back from the brink about 200 feet, lowers another man, seated in a boatswain's chair, over the side of the precipice. As he descends slowly he loosens such rocks as he deems wise with his chisel and hammer. It sometimes has happened that heavy masses of rock have hurled one or both of the men to their death at the bottom of the quarry.

CARS TAKEN UP INCLINE TO SECOND STORY

Having decided that a certain second-floor auditorium was the best place to hold the Wheeling, W. Va., automobile show, its promoters then set about to devise ways to get the machines into the display room. Finally permission was secured from the city council to construct a wooden incline leading to a large second-story window in the auditorium. A track having two grooves wide enough to guide automobile wheels surmounted the temporary structure. Some machines ran up the track on their own power.

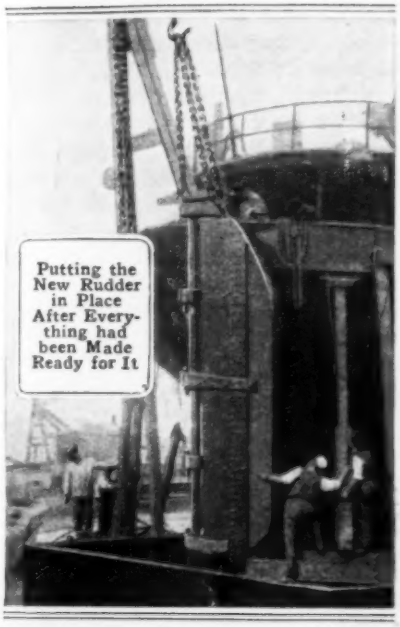


Unusual Method of Elevating Automobiles to a Second-Story Show Room

COATING FOR BLUEPRINT PAPER AT LESS COST

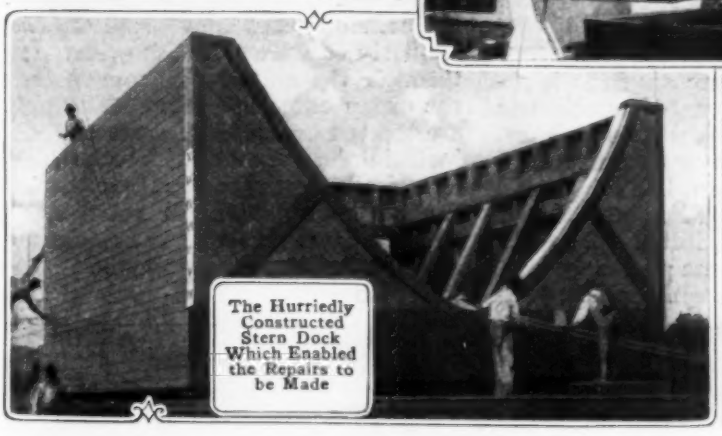
A simple apparatus has been devised by the Bureau of Chemistry of the Department of Agriculture by which potassium - ferricyanide solution may be produced more economically than by methods now employed. This chemical is extensively used as a coating material for blueprint paper, and since the war began has advanced in price to $6 per pound, whereas formerly it was only 55 cents per pound. It has been found that potassium ferricyanide can be produced by oxidizing a solution of potassium ferrocyanide with chlorine gas. At the same time a small amount of potassium chloride is produced, which, however, does not interfere with the color or quality of the prints. Consequently it is unnecessary to separate the potassium chloride by crystallizing the potassium ferricyanide, provided the latter is to be used on the spot and soon after it has been prepared. At present prices the solution can be made by this process at about $2.80 per pound, calculated on a dry-salt basis; under normal conditions the cost would be about 35 cents per pound.

RUDDER PLACED ON SHIP OUT OF DRY DOCK

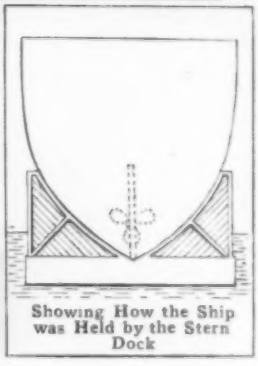


Putting the New Rudder in Place After Everything had been Made Ready for It

Swinging the Stern Frame into Position. The Old Part and Rudder were Broken Off during a Severe Storm Which the Vessel Encountered While at Sea



The Hurriedly Constructed Stern Dock Which Enabled the Repairs to be Made



Showing How the Ship was Held by the Stern Dock

Repairs of a difficult nature were recently made upon the steamship "Honduras" in quick time at Galveston, where no dry dock is available. The vessel, after breaking down at sea and navigating for more than a hundred miles with a hastily devised steering arrangement, was towed into the port with its stern frame completely broken off and its rudder gone. The delay that would have been occasioned by towing it to Mobile or New Orleans, where the docks were already overcrowded, caused the work to be undertaken at Galveston. In five days' time a stern dock was constructed and put at the disposal of the repairmen. With it the rear end of the vessel was raised out of the water and made ready for the new rudderpost, sole piece, and rudder which were being made for it at a local steelworks. The stern parts, which were built up with structural steel, were declared to be stronger than

the original casting. It is expected that the repair, which was made under great handicap, will be accepted as a permanent part of the vessel.

AIR CALLIOPE HAS MANY SPECIAL ADVANTAGES

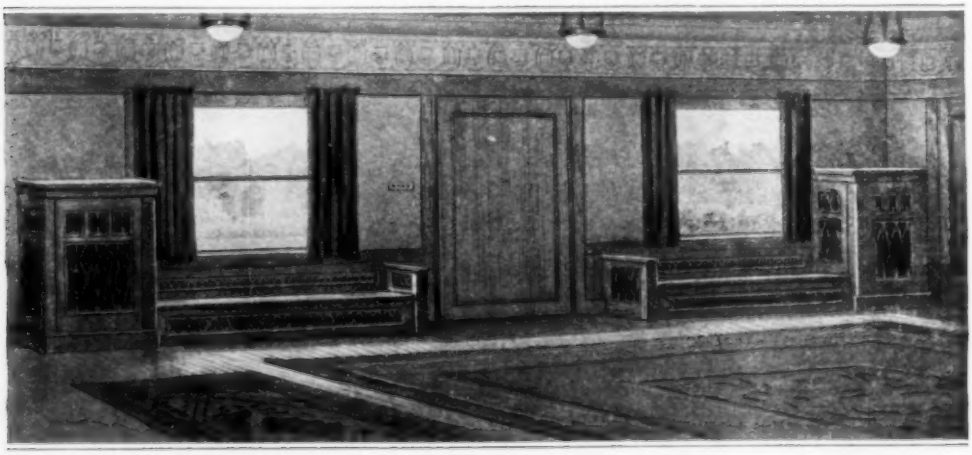
A substitute for the old-fashioned steam calliope is to be found in air calliopes recently placed on the market.

A Calliope Operated by Compressed Air: The Volume of the Tones can be Easily Varied by Means of Pedals, Shown Above

These instruments use air from high-pressure blowers operated by electric or gasoline motors, or steam engines. A 2-hp. electric motor constitutes a part of the mechanism, but for parade purposes this can be disconnected and gasoline power substituted. The old calliopes generally were played by men because of the strength required to operate the valves; the keys of the modern instruments can be played by a child. Heretofore the large calliopes had 32 pipes, but these are made with 43 and even 55 whistles, which are of polished brass. Those on the instrument shown herewith vary from ½ in. in diameter to 5 in., and the greatest length is 4½ ft. Pressure can be varied at will from ¾ lb. to 20 lb. At 2-lb. pressure the instrument produces tones like a pipe organ and can be used to accompany a band. The air calliopes are self-contained and weigh about 900 pounds.

PIPE ORGAN CONCEALED IN NOVEL MANNER

A pipe organ has been concealed in a large California home in a novel way. Near two large windows in the room in which the console is located are two cabinets having sides ornamented with grill work. Adjoining the cabinets and the windows are long window seats similarly ornamented with grills. It is through these that the sounds from the organ enter the room. The pipes are located beneath the seats and cabinets in the basement. The organ is electrically operated, and the console can be moved about the room as desired. This portable part of the instrument is finished to match the rest of the woodwork.



Sounds from a Concealed Pipe Organ Enter This Room through the Grills in the Window Seats and Cabinets

BEATING THE SWORD BACK INTO THE PLOWSHARE

How England Plans to Turn Her Munition Factories to Peace Uses after the War

By R. J. BJURSTEDT

THE day is long past when, as in the Middle Ages, the plowshare could literally be beaten into a sword or armor at the outbreak of a war, and then, when war was over, be beaten back at the convenient smithy into a plowshare again. And yet, in spite of the fact that the war of today is fought with battleships and guns which require years to build and are capable of performing no functions of practical usefulness—save that of moral influence—in peace time, a strong effort is still made to get all the war service possible out of peace equipment, and, reciprocally, to turn back to peace service after the war is over not only all of the one-time peace equipment that had been converted to war use, but also as much as possible of the specially created war equipment which has served its purpose.

The first part of this operation—the beating of the plowshare into the sword through industrial mobilization—has been going on in all of the belligerent nations ever since the outbreak of the present struggle, but because each of the Continental countries—and especially Germany—had a peace equipment more or less calculated to serve war-time demands, the movement has been most pronounced in England, which, though in many respects the world's greatest industrial nation, was almost totally unprepared to divert its great energies into military channels. So inflexible was England's industrial organization that next to nothing had been accomplished at the end of the first six months of the present conflict to divert the country's efforts to war work, and it was not until Lloyd George's specially created ministry of munitions began to settle down to business along toward the first anniversary of the outbreak of the war, that her almost incalculable manufacturing potentialities began to make themselves felt in the war scale. The months which followed were those corresponding to the beating of the plowshare into the sword, and something of how this was done has already been told in Popular Mechanics Magazine. Bicycle factories built aeroplanes and rifles, agricultural-implement factories built trucks and tractors, factories for the manufacture of cutlery, typewriters, cameras, sewing machines, and the like made fuses and other munition accessories requiring delicate handling, while various and sundry shops of all descriptions were turned into factories for the desperately demanded high-explosive shells. Similarly, great cotton and woolen mills bent their energies to turning out khaki and other fabrics for uniforms, while breweries and distilleries worked to increase the supply of war chemicals.

At the end of the twenty-second month of the war, with several thousand English establishments, formerly engaged in the manufacture of the regular commodities of peace consumption, under government control, the period of beating the plowshare into the sword may be said to have come to an end. There now remains an indefinite—but probably not very long—period in which the fully forged sword will do its duty, after which, with the relaxing of the maximum military effort as peace comes in sight, the period of beating the sword back into the plowshare will be entered upon. Fortunately for England, this contingency, foreseen from the first, has never been lost sight of, and this second transformation will be gone through with much more smoothly and economically than was the first.

Doubtless the first factories to resume normal activities will be those which, without altering their mechanical installation, have merely turned their output from the ordinary trade channels to the government. Next in

order will come those plants in which new or modified machinery has been installed for the manufacture of certain lines of war products. In every instance these changes have been of as temporary a nature as possible, and any new machinery installed has been designed with a view of ultimately adapting it to the manufacture of peace products at a minimum of time and expense. In this way many concerns which have added considerable war-work extensions will find themselves in the possession of greatly enlarged plants when peace again permits them to resume normal activities. A strong incentive to extend plant and improve machinery, it may be observed, has been furnished by the existence of the war-profits tax, which is levied with the purpose of taking upward of 50 per cent of the profits of any concern which are directly traceable to the war or war work. By expending a considerable part of his gross profits on renewals or extensions, a proprietor has more to show for his money than if he had allowed it all to fall subject to the heavy war-profits tax.

There is scarcely one of England's great factories, especially in metal-manufacture lines, which will not await the resumption of its regular activities with anywhere from a 50 to 400 or 500-per-cent increase in size, as well as an incalculable increase in efficiency. This class—it includes all sorts of plants, such as steel mills, locomotive, automobile and bicycle factories, tanneries, shoe factories, cotton and woolen mills, etc.—will doubtless confine itself after the war to the manufacture of more or less the same line of products turned out previously, but, on account of the fiercer trade war that will be waged in the world's markets, devoting more attention than before to distribution. If they can only find market for their increased outputs, then, it will not be many years before the war development of even such industrial plants as existed in England prior to August, 1914, will have become a source of additional income sufficient to take care of a very large part of the financial burden the great struggle will leave behind.

The new specially built munition works also promise to prove an important addition to England's industrial establishment of the future. Remarkable as has been the manner in which munition communities have sprung up at certain points on the eastern seaboard of the United States, it has been nothing to the corresponding movement in England, where the mushroom "shell town" is to be found at many places where there were only moors or marshes or stretches of sand a year ago. Some of the greatest of these establishments are only just being completed and put in operation. For a while there was a rather pessimistic feeling in the country that the huge expenditures on these new munition works were destined to prove a dead loss economically; that after the war there would be no alternative but to tear down these swiftly but yet expensively erected buildings just as the stucco palaces of a great exhibition are destroyed when they have served their ephemeral purpose. It has recently become known, however, that such of the new munition factories as the government does not feel it imperative to maintain permanently as arsenals will be converted into factories for the manufacture of aniline dyes and numerous other industrial chemicals of which Germany, through specializing upon, has hitherto had a practical monopoly in English markets, as well as in those of the rest of the world. England invented aniline dyes, and as the world's largest producer of coal tar, the base from which they are made, has long resented the fact that her indefatigable Teutonic trade rival quickly perfected the dye industry to a point where he could sell that product at a cost which was not long in killing forever the important indigo industry of India. A small factory hurriedly erected to supply the country's immediate needs has already succeeded in producing the aniline dyes, if not cheaper than they are produced in Germany, at least very

much cheaper than Germany used to sell them to England. That this has been done in spite of the labor shortage and scarcity of materials incident to the war, has made the British Board of Trade very optimistic of what may be accomplished when more normal conditions are prevailing.

Certain favorably situated munition factories, with such of their mechanical equipment as is available, will be devoted to the manufacture of the Diesel and other types of the internal-combustion engine, a line in which Germany had a commanding lead up to the outbreak of the war. Heavy electrical machinery is another line in which England plans to figure more extensively in the future through taking advantage of her augmented industrial facilities and heightened efficiency, and this is a department in which the United States as well as Germany will feel the effect of new competition.

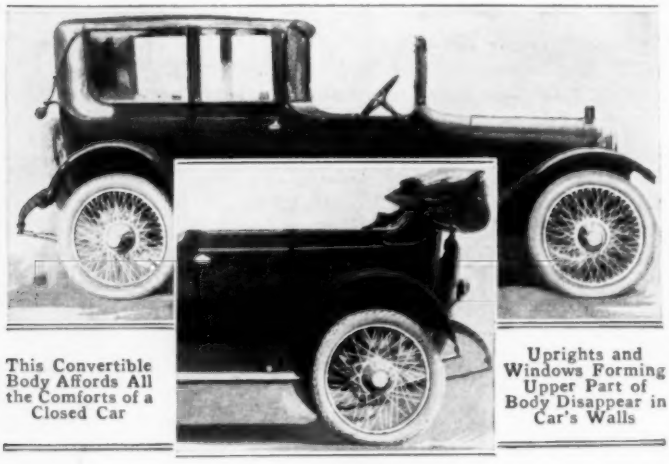
The same factors which will operate to make Great Britain a more potent force industrially after the war will also be effective in Germany, though not nearly to the same extent. In the first place, Germany was already so thoroughly organized that there was little room for improvement in this respect, and, in the second place, that country was so well prepared for munition manufacture that there was no such demand for an increase of facilities as in the case of England. Also, where such an increase was called for, the numerous factories which were compelled to shut down with the cutting off of Germany's export trade made much additional construction unnecessary. As a consequence of this, then, where England's industrial establishments have increased anywhere from 15 to 25 per cent in capacity, Germany's have probably not increased more than 5 to 10 per cent. In the same way, a heightened industrial efficiency of anywhere from 20 to 30 per cent in England will hardly be met by one of more than 4 to 6 per cent in Germany, which should not be taken to mean, however, that the efficiency of Germany will not still be considerably above that of her great rival.

Just how much the industrial potentialities of all of the belligerent nations will be cut down by their losses of men will not be apparent until after the war, but it is certain that, unless the latter is much more prolonged than now seems probable, this will not come anywhere near offsetting the forces just alluded to as operating to increase those potentialities. The burdens of the great war debts that will be left upon the shoulders of each of the belligerent nations will—in raising taxation, and through that the price of labor and ultimately the cost of production—chiefly affect their foreign trade. As each of them will labor more or less under the same sort of handicap, they will be at a disadvantage in competing only with such industrial nations as the United States and Japan, which have comparatively light burdens imposed as a consequence of the war.

The fact should not be overlooked that Germany, in this commercial war as at the outbreak of the political one which still rages, will have all the best of things on the score of immediate preparedness. That remarkably organized country, partly in commodities left on hand when her ports were closed, and partly in the accumulation of untiring industry during the war, is known to have on hand close to a billion and a half dollars' worth of goods ready to be launched upon the markets of the world the moment that German keels are free to plow the ways of the sea again. This, it is feared in the allied countries, will be thrown by Germany upon the world markets regardless of cost, with the twofold purpose of regaining lost trade footholds and raising quickly the capital which will be so desperately needed in the Fatherland to set the wheels of industry revolving again. How to meet and counteract this colossal piece of "dumping" is actively engaging the attention of France and England at this moment, and the problem is one that will loom larger every day that peace draws nearer.

COLLAPSIBLE BROUGHAM HAS MANY ADVANTAGES

A completely collapsible brougham has just been brought out which combines the comforts of an expensive closed car with the attractive features of a touring car, thereby uniting in one automobile features which make it desirable for use the year around. It is so constructed that the windows and adjoining upright parts disappear in the walls of the body. The top folds back and takes up no more room than the folded top of a touring car. Fine broadcloth is used in the upholstery; all of the appointments of a high-class closed car are provided, such as toilet articles, cigarette lighters, dome lights, etc. The body can be opened or closed within five minutes. The car has seats for seven passengers, with full window space for all.

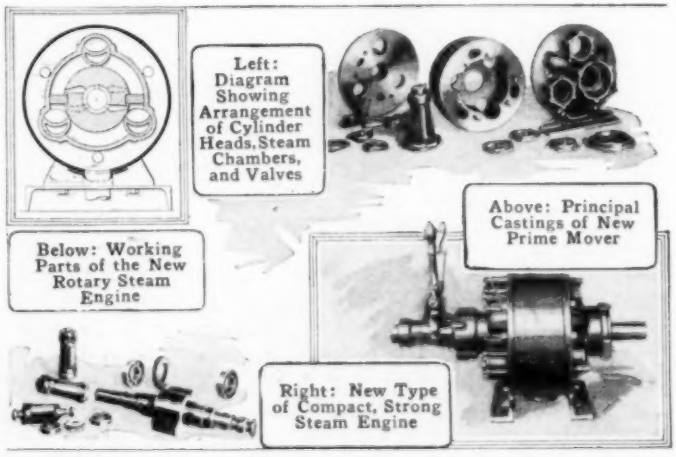


This Convertible Body Affords All the Comforts of a Closed Car

Uprights and Windows Forming Upper Part of Body Disappear in Car's Walls

STEAM ENGINE OF NEW TYPE HAS BIG POSSIBILITIES

A rotary steam engine which may work great changes in the designs of steam prime movers because of its simplicity, compactness, and power, is now being brought out in this country and in Canada. In principle it bears some resemblance to the steam turbine. The steam enters the center of the engine through a stationary sleeve about which revolves a central rotating member or shaft, to which two pistons are attached. The steam on passing through a port in one of these pistons enters one of three steam chambers that surround the shaft; its expansion causes the shaft to revolve. As it turns around, the pistons successively come in contact with three conical cylinder heads which revolve on their axes and by reason of a pocket in the side of each allow the pistons to pass. This revolving of the shaft and pistons likewise serves to open ports which permit the cylinders to exhaust.



Left: Diagram Showing Arrangement of Cylinder Heads, Steam Chambers, and Valves

Above: Principal Castings of New Prime Mover

Below: Working Parts of the New Rotary Steam Engine

Right: New Type of Compact, Strong Steam Engine

The engine can be reversed at any speed without jar or shock, since the inertia of the mass of steam is cushioned against the pressure at the boiler.

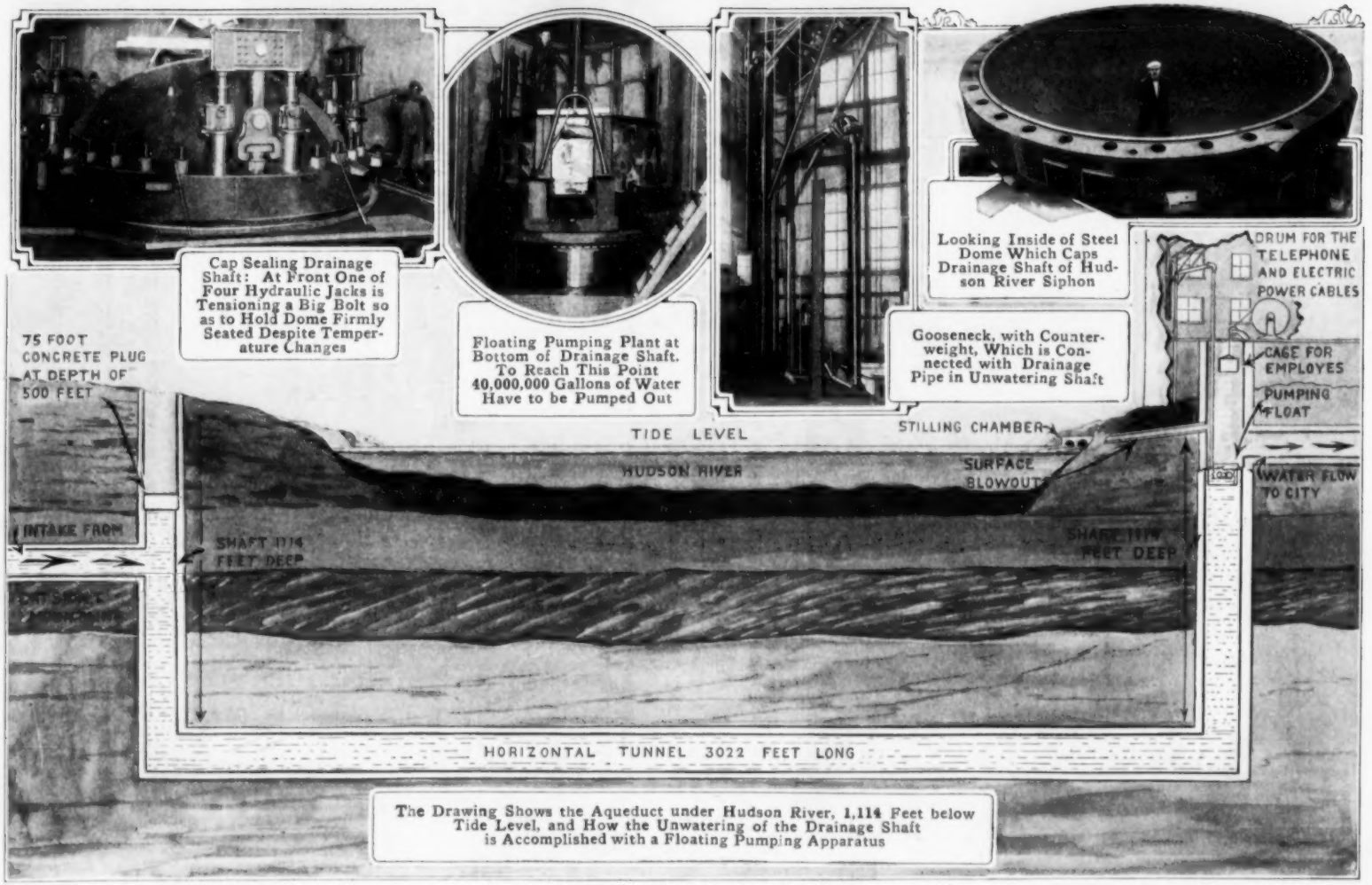
The Artist Here Shows the Steel Fighting Shield in Use by Machine-Gun Operators: It is Designed to Give a Soldier a Reasonable Amount of Protection from an Enemy's Fire, and Is Readily Portable

There is no cranking and no dead center. All four parts revolve in the same plane, producing very little vibration. To prevent steam leakage without packing, the principle of water grooving is employed; that is, in the .001-in. space between the steam chamber and the peripheral edge of the pistons parallel grooves are placed which fill with condensed steam, making a water-tight and air-tight joint. The inventor has been 11 years developing this engine. Because of its efficiency, power, and low water consumption, it is claimed to be particularly adapted to marine, mine, hoist, and truck use. Speeds varying from 10 to 5,000 revolutions per minute can be secured.

STEEL FIGHTING SHIELDS DEVISED FOR SOLDIERS

In an attempt to provide a means of giving soldiers on the firing line greater protection than is afforded by ordinary intrenchments, a Texas inventor has designed a portable fighting shield. This is virtually a hollow prism with armored walls and is mounted on two wheels so that it may be drawn by a motor truck when an army is marching. When in use the device is unlocked at its base and folded down. From the front side, when in this position, it looks like a steel wedge. The part corresponding to the base of the prism forms a flooring that extends out at the rear. Loopholes through which the muzzles of rifles and machine guns may be projected, and back of them gun rests, are provided. The walls of the shield, as presented to the enemy, are at such an angle that projectiles striking them would glance off harmlessly. Several units of this kind, when assembled in a line, would form a steel rampart and, according to the inventor, could be used with equal facility on either level or hilly ground. The units are light in weight and capable of being built cheaply, it is stated. If a very long line of the shields were used, however, it seems apparent that difficulty would be encountered in keeping them from falling to the enemy, should it become necessary in the course of a battle to beat a retreat. Normally, however, their transportation would be simple.

¶ Bibles, about an inch square and 3/8 in. thick, are worn by many Russians as watch charms.


Cap Sealing Drainage Shaft: At Front One of Four Hydraulic Jacks is Tensioning a Big Bolt so as to Hold Dome Firmly Seated Despite Temperature Changes
Floating Pumping Plant at Bottom of Drainage Shaft. To Reach This Point 40,000,000 Gallons of Water Have to be Pumped Out
Looking Inside of Steel Dome Which Caps Drainage Shaft of Hudson River Siphon
Gooseneck, with Counterweight, Which is Connected with Drainage Pipe in Unwatering Shaft
DRUM FOR THE TELEPHONE AND ELECTRIC POWER CABLES
CAGE FOR EMPLOYES
PUMPING FLOAT
75 FOOT CONCRETE PLUG AT DEPTH OF 500 FEET
TIDE LEVEL
STILLING CHAMBER
HUDSON RIVER
SURFACE BLOWOUT
WATER FLOW TO CITY
INTAKE FROM
SHAFT 1114 FEET DEEP
SHAFT 1114 FEET DEEP
HORIZONTAL TUNNEL 3022 FEET LONG

The Drawing Shows the Aqueduct under Hudson River, 1,114 Feet below Tide Level, and How the Unwatering of the Drainage Shaft is Accomplished with a Floating Pumping Apparatus

A PUMPING PLANT THAT DESCENDS AS IT PUMPS

BY ROBERT G. SKERRETT

THE engineers of the city of New York have nearly completed the most wonderful aqueduct in the world —a great system which reaches from the Catskill Mountains to a terminal reservoir on Staten Island, a total course of quite 125 miles. But it is not enough to rear great dams and to drive tunnels and shafts through mountains and under rivers and streams. The experts of the Board of Water Supply have had also to provide emergency equipment, and probably the most notable of these is the pumping plant lately finished and tested for the unwatering of the titanic Hudson River siphon and certain of its tributaries.

In order to lead the aqueduct through solid rock beneath the river, it was necessary to cut two shafts 14 ft. in diameter, one on each shore, right down to a depth of 1,114 ft. below tide level, and then to join these shafts by a horizontal tunnel 3,022 ft. long, in this fashion producing an immense square-cornered "U" with its upper ends reaching to the light of day. The western shaft is sealed by a great plug of concrete, 75 ft. long, secured at a depth of more than 500 ft., and just above where an intake tunnel pours its flood from the Catskill Mountains. The eastern shaft has no such plug, but is capped by a massive dome of steel which is ordinarily held down by many large bolts so as to keep it in place against the pressure of the water column reaching fully 400 ft. higher where it passes southward on its journey to the metropolis.

This capped shaft is known as the drainage shaft, and a special plant has been developed for the purpose of unwatering the tributary section of the aqueduct and the siphon itself. The water to be disposed of amounts to 40,000,000 gal. when this part of the aqueduct has drained itself through surface blowouts down to tide level. Five different ways were proposed for dealing with this unusual problem, but after much study the engineers decided to employ a novel pumping equipment which should be placed upon a float and which would really pump the water out from under it, and thus by its own efforts gradually reach the bottom of the shaft after traveling a total distance of nearly 1,150 ft. Of course, it was realized that the pumps would have to lift the water higher and higher as the float sank lower and lower. However, this difficulty has been disposed of ingeniously.

The float, or boat, as it is also called, is a cylinder of steel with a diameter of 12 ft. 9 in., a depth of 18 ft., and a total over-all height, including the canopy, of 30 ft. When full-laden, i. e., bearing the load of the pumps and other apparatus, and carrying the weight of a 10-in. discharge pipe, loaded with water, reaching upward 1,135 ft., the float rises above the water something like two feet. To steady the cylinder during its descent, and while its load is increasing from minute to minute, there are vertical guides cast in the concrete lining of the shaft which are engaged by sleeves or slides, arranged vertically upon the outside of the float. These also prevent the boat from revolving.

The discharge pipe is joined at its upper end to a gooseneck made of 10-in. pipe, one end of which travels up and down in a well which receives the exhaust water and leads it away to the river. This gooseneck has a vertical movement of 20 ft., and follows the discharge pipe attached to the pumps as the float descends. When the pumps have discharged enough water to cause the float to sink 20 ft. into the shaft, they are stopped for a few minutes, during which the gooseneck is disconnected from the discharge pipe and raised 20 ft. The gap so formed is filled by a new length of discharge pipe. In this manner, 20-ft. sections are added to the descending pipe line and the discharge circuit maintained.

The unwatering plant consists of two four-stage vertical centrifugal pumps,

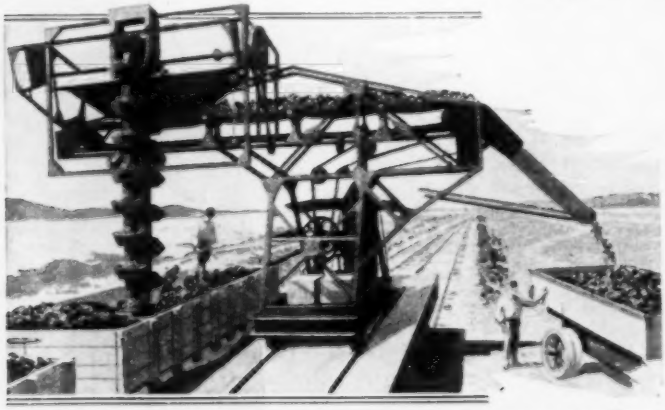
each of which is actuated by a direct-connected electric motor. The joint capacity of these pumps when speeding at 1,800 revolutions a minute is equal to 5,500,000 gal. per day. It would take a little over seven days' continuous working to drain the Hudson River siphon and its tributary sections of the aqueduct. Neither pump alone is capable of lifting the water to the surface when the float has reached a depth of more than 650 ft. below tide level, but the engineers have overcome this by linking up the pumps in series. That is, one pump working at full head discharges into the other pump, and the latter, taking the water at a pressure of 525 lb. to the square inch, can then send it onward by its own effort up to the surface.

The pumps are supplied with "juice" by means of a cable, also containing the lighting circuit, which is unwound from a great reel and which is paid out in unison with the float's descent. From another part of the same reel is fed the circuit for the telephone which is installed upon the float. In this way the operators on the boat and the people at the surface can keep in constant communication. The float also carries a small pump for removing water which may drip or leak into it. Its working platform is protected by a steel canopy. This is necessary, because any object, even a small one, dropped down that shaft might do serious harm.

Relief operators are sent down in a cage much like that employed in mines, and the men that have finished their work are brought up in the same way. This means of unwatering is necessary at several points in the aqueduct system, especially where pressure tunnels are concerned, as is the case in the rock beneath the Rondout, the Wallkill, the Hudson, and Croton valleys, as well as the boroughs of Bronx, Manhattan, and part of Brooklyn. These tunnels must from time to time be subjected to hydrostatic tests and afterward examined to see that they are structurally in perfect condition. Likewise, all parts of the vast system will have to be cleaned at intervals. Accordingly pumping plants of this sort are needed at several places, but the conditions in the Hudson River siphon are the most trying—in fact, unparalleled.

NEW FREIGHT-CAR UNLOADER DISCHARGES INTO WAGONS

To facilitate the unloading of bulk cargoes, such as coal, gravel, and sand, from freight cars, a California inventor has designed a combination bucket and belt-conveyor apparatus to discharge material into waiting wagons. The mechanism is mounted on standard railway trucks so that it can be brought alongside the cars to be unloaded. A vertical bucket conveyor is mounted to travel along the arms of the steel framework which supports it, and clear a car from one end to the other. The hoisting apparatus discharges the material through a hopper onto a belt conveyor that carries it to an adjustable chute at the opposite side, through which it drops into wagons. The device is operated by a motor.



The Machine is Built to Unload Cars Quickly and Lessen the Labor Charge and Time Consumption of Such Work

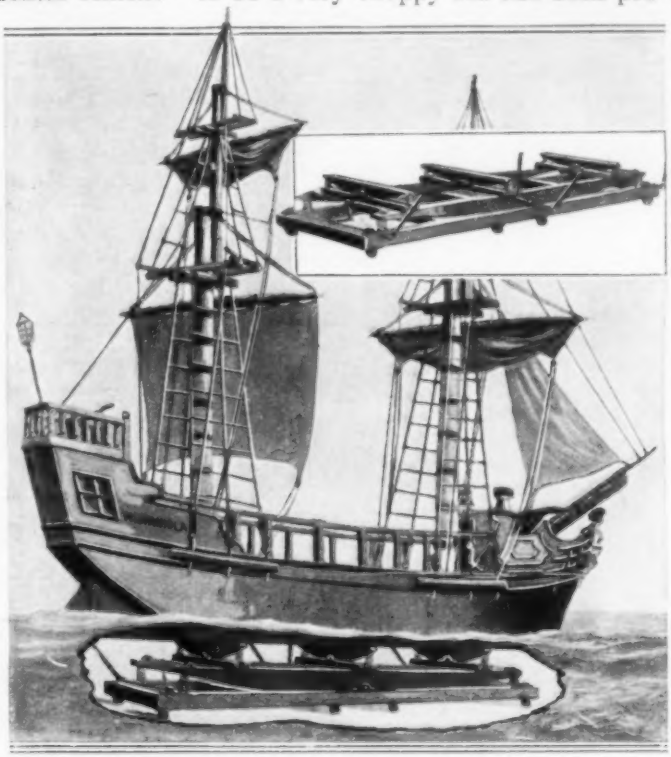
NEW CEMENT FOR FILLING TEETH ALMOST IDEAL

Several months of experimenting and study in a Pittsburgh research institute have produced a dental cement in which, it is claimed, are combined to a remarkable degree the plasticity of the cements now used for fillings, the appearance of porcelain, and the durability of gold. At the present time there is no substance in use by dentists which possesses all of these qualities. An investigator in the institution referred to was permitted to devote his entire time to research along this line. After two years of labor he has announced that he has produced a substance which apparently comes very near meeting the threefold demand as to appearance, plasticity, and durability. If such proves to be the case it will work a great change in dentistry. To be able to fill a cavity with a plastic substance that will quickly harden and retain the exact color of the tooth is something which dental experts have long sought in vain. Before the new cement is placed on the market, dentists in various parts of the country will be permitted to experiment with it and ascertain more fully than tests to date have shown, what its strength and durability are, and if it will retain its color. The producers believe that the new composition, which is a silicate cement, will undergo this test successfully.

¶A ton of chocolate candy and a ton and a half of stick candy were ordered a few weeks ago for the American expeditionary force in Mexico.

PIRATE SHIP THAT ROLLS AND PITCHES ON STAGE

A stage ship that rolls and pitches in a most realistic manner on what seems to be a very choppy sea has been produced by a New York theater manager as one of the principal scenic features in a dramatization of Stevenson's "Treasure Island." The "Hispaniola," on the deck of which the actor-pirates fight so fiercely, is 32 ft. long and its topmast rises 31 ft. above the stage. Underneath the vessel is a rectangular framework set on casters; resting on this low truck are two cradles. The lower of these is employed to rock the ship fore and aft by means of a rocker shaft operated by stage hands. Above it and fastened to the ship is the second cradle, having three transverse rockers also operated by a rocker shaft. Springs and chains at the ends of the rockers steady and limit the tossing of the boat. The makers have produced



The Stage Ship "Hispaniola" of "Treasure Island," Set on a Double Cradle That Enables It Both to Roll and Pitch Realistically

with considerable accuracy of detail a vessel resembling an old pirate craft of the Caribbean. Much is added to the scene by the use of a wind machine which fills the air with the noises of the sea while the sails snap and the flag waves in the breeze, and water dashes against the bow. The stage carpenters have built this boat so that it can be easily taken apart and transported from one theater to another. The rocking mechanism and the men who operate it are concealed from the audience by a "sea" made of green cloth.

CONICAL FLAME OF GAS BURNER SAVES FUEL

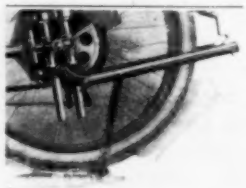
A gas burner by means of which fuel gas may be burned completely regardless of the volume of gas used, and which accomplishes this perfect combustion in the shortest possible space, is being made by an English firm. For metal melting, heating laundry irons, tinners' stoves, etc., it effects a considerable saving. The feature of the burner is a concave disk at its end, having perforations which cause the escaping gas to converge to one point, making a conical flame. This disk, the curve of which is carefully calculated, counteracts the tendency of some of the gas when relieved of pressure to escape from the flame through expansion. With this burner all gas not consumed near the base of the cone is forced through the hottest part of the flame, the apex, where it cannot well escape combustion. The successful operation of these burners is dependent on two factors: the proper mixing of the air and gas before they come to the burner, and the placing of the air under some positive pressure.

ELECTRIC POCKET LIGHT WHICH HAS NO BATTERY

An electric pocket lamp which has no battery has been invented by a Hungarian and is now on the market. In appearance and candlepower it resembles the ordinary tubular battery lamp. It is provided with a small dynamo and permanent magnet, concealed in the handle. To operate the lamp the thumb presses and then releases a spring-held lever projecting from the side. The lever returns to its position on being released and the operation is repeated practically as long as the light is in use. The motion of the lever puts into tension another spring that rotates the magnet at nearly constant speed by means of cogwheels. Enough energy is stored by the device to keep it burning three minutes after the working of the lever has ceased. The same idea is applied to a lamp of larger power that is operated by pressing two handles together; it is adaptable also to other uses, such as in igniting dynamos for blasting.

MOTORCYCLE STAND WORKS LIKE A JACK

An improved stand which is being attached to new motorcycles consists of the ordinary U-shaped motorcycle stand to which is pivoted at one side, a few inches from the hub, a short rod that just reaches to the ground when the free end is dropped down. After it has been allowed to drop into this position, the rider presses the rear of the stand with his foot. Thereupon the whole device acts like a jack and raises the rear of the motorcycle. It is then swung into its final position by giving it a slight jerk backward. When the motorcycle is in use, the supplementary bar is held up out of the way by a spring device that is located at its outer end.



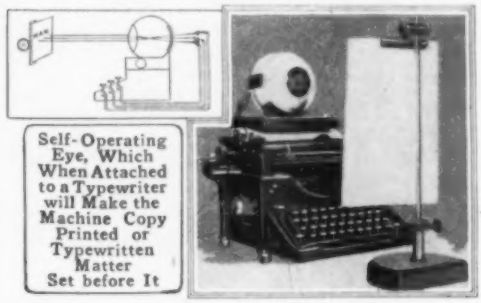
EYE ENABLES TYPEWRITER TO COPY AUTOMATICALLY

A self-operating eye, which when attached to a typewriter enables that machine to copy any printed matter properly set before it, is the invention of a Brooklyn electrical engineer. The eye consists of a large sphere having a lens on its front side and a field corresponding to a retina on which are situated a large number of selenium cells connected with a source of electric current. The eye is mounted on and moves with the carriage of the typewriter and is so focused that the image of but one letter is reflected in it at a time.

To understand clearly the arrangement of the selenium cells it is necessary to explain that if all the letters of the alphabet are superimposed on each other, over a blank field, it will be found that certain portions of each letter cover sections of the field that are not covered by any other letter. It is on these isolated spots, each of which is distinctive of a certain letter, that the selenium cells in the retina are placed. That each letter may be so reflected that its image will overlap as little as possible the field covered by the reflection of other letters, a special screen is provided which narrows the lines of each letter's reflection.

When the letter "R," for example, is thrown on the retina a portion of the image of that letter will fall on a certain selenium cell which no other letter would cover; and since the R cell is in partial shadow because of this image resting on it, the electric current passing through it by means of its wire connections is decreased. This allows a relay armature to move, and so closes a local circuit and also actuates an electromagnet which in turn operates the R type bar of the typewriter, and prints the character on the paper. When this is done the carriage automatically moves ahead one space, and the printed letter next to the R is reflected on the retina, producing a similar set of motions.

The typewriter is fitted with devices which move the carriage a space when a blank space is brought in line with the eye, and which do line spacing at

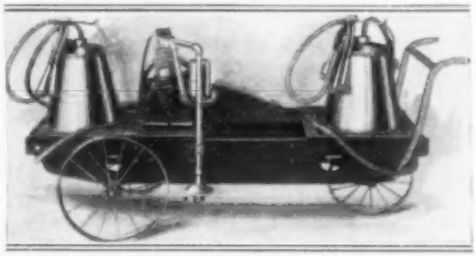


Self-Operating Eye, Which When Attached to a Typewriter will Make the Machine Copy Printed or Typewritten Matter Set before It

the proper time. The machine has not been perfected for commercial purposes, but it is proposed to make it suitable for copying letters, instead of using carbon paper, and for many other kinds of office work.

PORTABLE MILKING OUTFIT FOR SMALL DAIRYMAN

For the small dairy farmer a portable milking machine has been developed which meets all ordinary needs and does not necessitate an excessive expenditure. The entire equipment is mounted on a three-wheeled truck which may be drawn from stall to stall as it is used. A dual set of suction cones is provided, enabling two cows to be milked at the same time. The power plant, consisting of either an electric motor or gasoline engine, as desired, is mounted near the middle of the carriage, separate containers being placed at opposite ends. From 16 to 20 cows can be milked in one hour and at a cost that is almost negligible. The truck is slightly more than five feet in length and weighs 250 pounds.



Two Cows can be Milked at Once, and the Machine Moved from Place to Place as Needed

FASHIONABLE SUMMER AND MOTORING GARMENTS

Tiny Pocket Provides a Place for Handkerchief When One is Dancing
Stockings Decorated with Very Delicate Lace Butterflies
Hunting and Riding Habit of Checked Velour: The Natty Cape may be Worn Either as Shown or as a Skirt
Heavily Beaded White-Silk Hosiery with Black-Satin Slippers Trimmed with Rhinestones, a Stylish and Effective Combination
Right and Left Hose for Men Have No Surplus Material to Cause Corns
A Seasonal Vanity, Painted Stockings, is Pictured Below in Two Popular Patterns, Butterflies and Buttercups
White Hose Ornamented with Opal Spangles, Worn with Silver Slippers
Tan and White Sport Shoe with Fringed Protector Tongue
Imported Flowered Slipper of Distinctive Style Recently Introduced to American Women
Washable Linen and Piquè Spats for Summer Wear

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AND LATEST MODES IN HOSIERY AND FOOTWEAR

Quite a Stylish Light-Colored Motor Coat is Worn by the Young Woman Shown in the Insert Below. It Is a Silk-Lined, Checked Tweed with Leather Collar, and Bands on the Cuffs

White Waterproof Storm Coat and Cap with Shoulder Cape for Chauffeur. It is Double-Breasted and Has a Dark Military Collar

Most of the Above Coats are Imported: The First Two from Left to Right, Standing, Are of Tanned Calfskin. The Stripes of the Gray and Black Coat Worn by the Girl Are Four and a Half Inches Wide

Washable Apricot-Satin Russian Blouse for Sports Wear. This Fabric is Especially Practical for Such Use

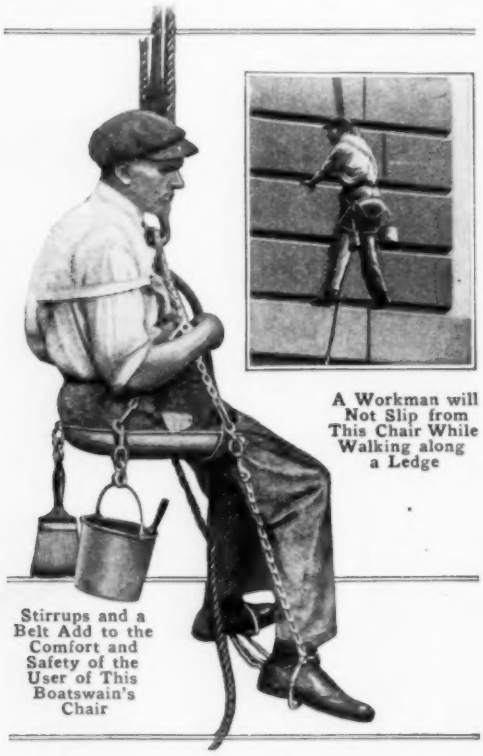
Pleasing Beach Outfit of Gray and Rose Cretonne: The Hat, Bag, and Cushion are Trimmed with Large Coral Beads, Which Add an Effective Color Tone

The Moleskin Collar, Cuffs, and Wide Band Make This White-Silk Jersey an Attractive Wrap for Cool Weather in Summer and Early Fall

THREE LOWER PHOTOS COPYRIGHT, UNDERWOOD & UNDERWOOD

BOATSWAIN'S CHAIR GUARDS AGAINST FALLS

A boatswain's chair has recently been devised which is much safer to use than the familiar suspended seat



A Workman will Not Slip from This Chair While Walking along a Ledge

Stirrups and a Belt Add to the Comfort and Safety of the User of This Boatswain's Chair

used by painters and other workmen; the latter consists of a board, notched at each end and inserted in a loop of rope. This chair is of pressed steel curved to fit the thighs like a farm-implement seat. It is supported by four chains, two at either side. A leather belt with a buckle in front is attached to the chains at the side, and is tightened about the waist of the workman. Suspended from the forward edge of the seat are stirrups fastened to adjustable chains. These assist the occupant in balancing and give him an opportunity to rest his limbs by standing in the stirrups. With this chair it is possible for one to walk along a course of stone or brick on the face of a wall, without danger of falling or losing one's support.

PUBLIC LIBRARY MAKES AND LOANS LANTERN SLIDES

One of the interesting examples of the widening sphere of service rendered by an increasing number of libraries in this country is found in Cincinnati, whose public library collects and makes stereopticon slides which it loans to patrons without charge. After 14 years of enlarging activity in this line, the institution has 20,000 slides in its files and also several stereopticon lanterns, which, with the services of an operator, may be secured for a nominal fee. The conditions on which the slides are loaned are that the borrower will be responsible for breakage, and that they be returned with reasonable promptness.

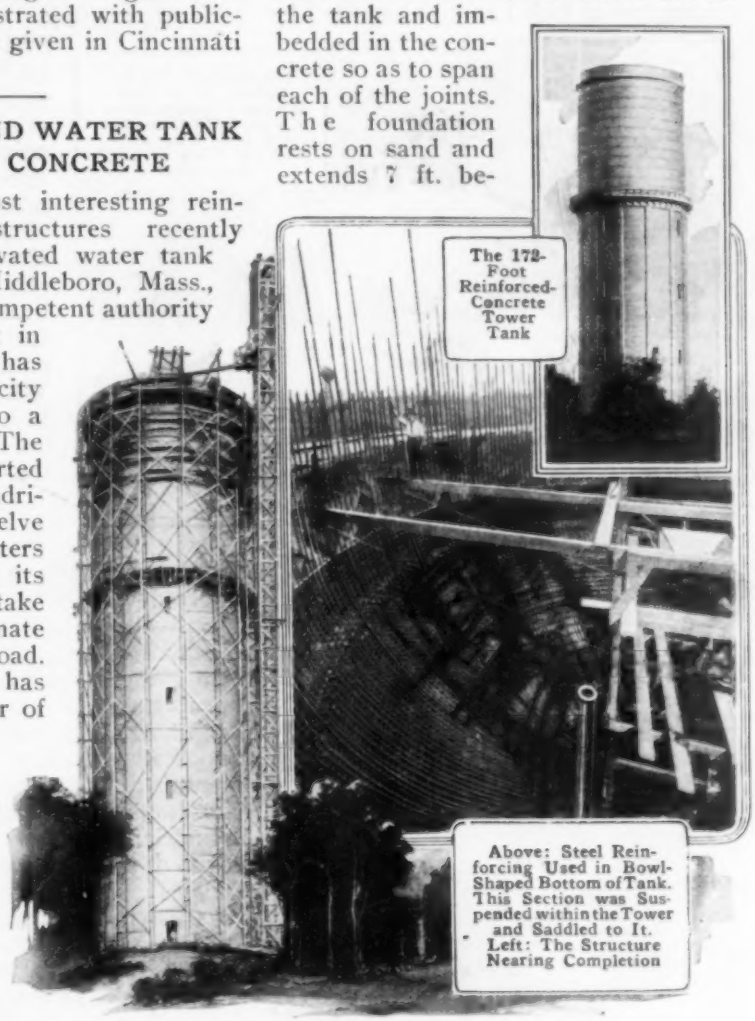
Just as most libraries will purchase books on subjects which its collection does not cover, so the Cincinnati institution will prepare slides on request. A short time ago, for example, a request was received for slides on English cottage architecture. The librarians gathered together from books and other sources an excellent collection of pictures on this topic and transferred them to glass for use in the lantern. It frequently happens that persons who have taken trips of interest wish to entertain their friends with illustrated talks on their journeys. In such cases the library will, under certain conditions, make up sets of slides which the traveler may borrow when he wishes, though they are the property of the library and subject to the claims of the first patron asking for them.

The material for the stereopticon department is filed in large cases having partitioned drawers, all the views being card-indexed. A patron wishing material for a lantern talk is given access to these collections, from which he makes his selections; from 25 to 90 slides is the usual number of views chosen, though the library does not place any restriction on the size of the loan. Nature clubs use this department a great deal in their study of outdoor life; teachers enliven their instruction in history and geography with views;

churches and Sunday schools employ the slides for entertainments; professional men, such as engineers and architects, doctors and dentists, draw on the collection for material to present at their special gatherings. Over 2,000 lectures illustrated with public-library slides were given in Cincinnati in one year.

BIG TOWER AND WATER TANK BUILT OF CONCRETE

One of the most interesting reinforced-concrete structures recently erected is an elevated water tank now in use at Middleboro, Mass., and asserted by competent authority to be the largest in this country. It has a 500,000-gal. capacity and extends to a height of 172 ft. The container is supported by a hollow, cylindrical tower and twelve 4 by 24-in. pilasters distributed about its circumference to take their proportionate amount of the load. The tank, which has an inside diameter of 41 ft. and holds a column of water measuring 59 ft. at the center, is bowl-shaped at the bottom. This part of it is suspended inside of the tower, its rim resting on the wall of the latter. In addition to the fact that the weight is more evenly distributed in this way than if a dome bottom were employed, the hemispherical form also gives a 47 per cent increase over the other in capacity for the same height of wall. The tank was constructed in sections, or rings, poured one on top of the other. Water-tight joints were obtained by providing around and near the center of each ring a continuous triangular groove, 1½ in. deep. This formed an interlocking bond when the next section was poured and it filled with concrete. In addition to this, 10-in. channel bands were bolted around the tank and imbedded in the concrete so as to span each of the joints. The foundation rests on sand and extends 7 ft. below the surface. When first tried out, a few hair cracks developed and the tank was further strengthened.



The 172-Foot Reinforced-Concrete Tower Tank

Above: Steel Reinforcing Used in Bowl-Shaped Bottom of Tank. This Section was Suspended within the Tower and Saddled to It. Left: The Structure Nearing Completion

¶A French authority declares that the normal range of an anti-aircraft gun fired at an angle of about 45° is increased from 35 to 40 per cent, due to the shell's passage through air strata of reduced density.

FARM AND OTHER MACHINERY DRIVEN BY MOTOR CAR

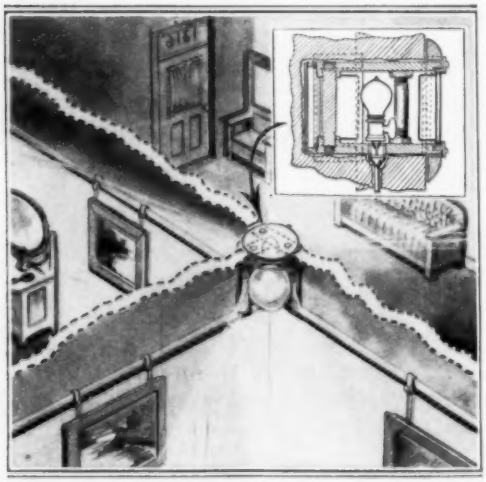
To enable a motor car to be used for driving various kinds of machinery, a convenient, although wasteful, power-transmission jack has been devised by a Minnesota man. Two parallel shafts carrying dish-shaped rollers at either end are mounted on a heavy timber frame which supports them several inches above the ground. This forms a cradle for the rear wheels of a machine, permitting it to run smoothly and without any strain on its working parts. A pulley held at an end of one of the shafts receives a belt that is extended to whatever machine is to be operated, as, for instance, a circular saw. A car is run onto the rollers by backing it over planks forming a track laid parallel with them. With a car mounting a 30-hp. motor, about 8 hp. is delivered in this way.

The Cradle is Shown Below: While This System of Power Transmission Is Not Economical, It Is Easy on a Car and More or Less Convenient

Sawing Wood with Power Derived from a Motor Car: The Rear Wheels of the Machine Rest on a Cradle Arrangement and Turn a Belt Pulley

ONE LIGHT MADE TO SERVE TWO OR MORE ROOMS

Two or more rooms, such as adjacent bedchambers and a hallway which most of the time require only moderate illumination, can be lighted economically by an auxiliary illuminating system lately devised by a New Jersey inventor. A specially designed lamp house, containing ordinarily a single incandescent globe, is permanently placed in an opening cut in a wall at a convenient height, or at the point of intersection of two walls, if three or more compartments are to be served by the light. The housing is made of metal and is cylindrical in form. Rounded, glass-covered openings are provided in its wall to permit the distribution of the rays given off by the lamp. The glass is frosted and ribbed so that the privacy of the rooms is not destroyed, while sliding shutters are provided to enable the light to be excluded from any one or all of the compartments. By a modification of this scheme, adjoining rooms and one immediately above them on an upper floor could likewise be served.

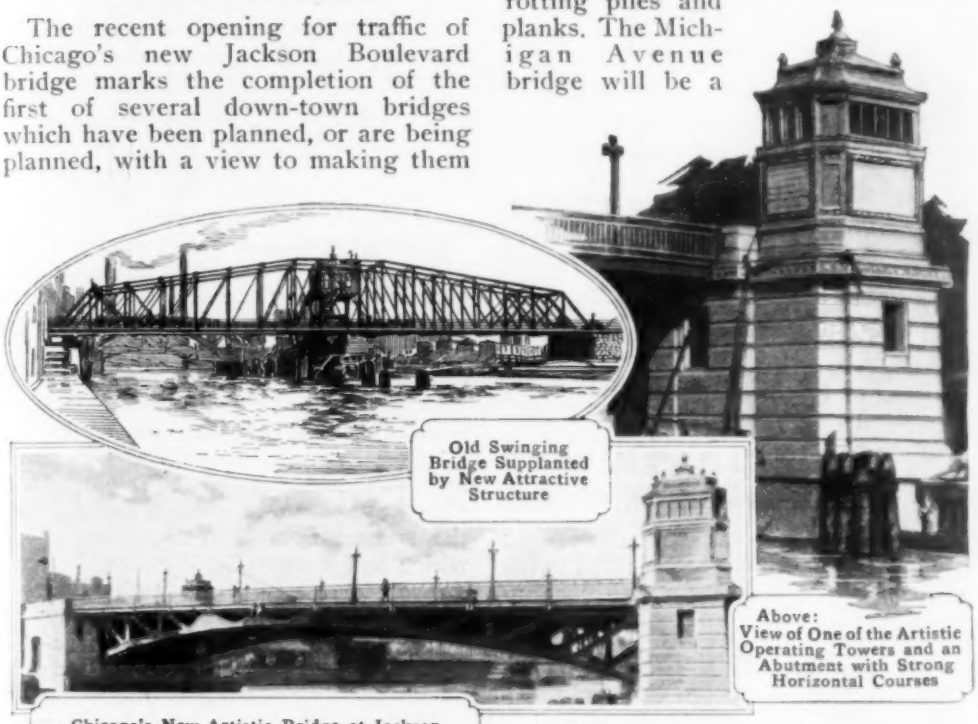


By Distributing the Light in This Way, Several Rooms may be Kept Moderately Illuminated at Low Expense

¶Last year live stock valued at $300,000 was killed on the national forest ranges by eating poisonous plants; 85 per cent of the losses of cattle were caused by tall larkspur.

FIRST OF CHICAGO'S ARTISTIC BRIDGES

The recent opening for traffic of Chicago's new Jackson Boulevard bridge marks the completion of the first of several down-town bridges which have been planned, or are being planned, with a view to making them objects of civic beauty as well as of utility. The Chicago Plan Commission coöperated in designing this structure and is now engaged with the city engineers in perfecting plans for other bridges, including one at Adams Street and one at Madison Street. The present Washington Street bridge conforms in a limited degree to the commission's ideals. The contemplated bridges will have, so far as structurally practical, features in common with the one at Jackson Boulevard. In it no structural steel appears above the roadway. The clearance is 120 ft. wide; massiveness in the abutments and apparent lightness and grace in the steel spans are qualities which the designers have sought. The abutments are of concrete marked off in strong horizontal courses. It is hoped that eventually the concrete work may extend from bridge to bridge so that the river may flow between smooth walls instead of rotting piles and planks. The Michigan Avenue bridge will be a two-level structure with ample proportions and wide approaches which will afford space for several decorative features, including groups commemorating historical events.



Old Swinging Bridge Supplanted by New Attractive Structure

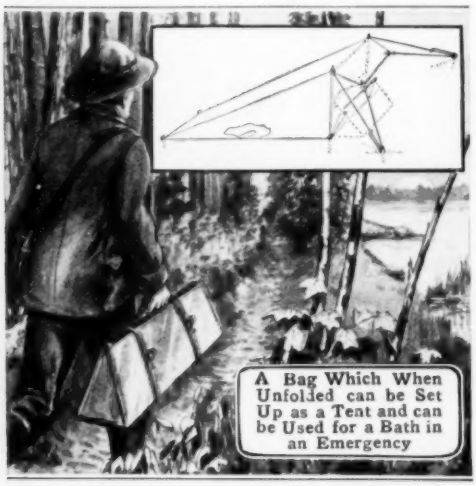
Above: View of One of the Artistic Operating Towers and an Abutment with Strong Horizontal Courses

Chicago's New Artistic Bridge at Jackson Boulevard: Several Others of Similar Design are being Planned by the City

WATERPROOF VALISE SERVES AS A TENT AND BATH

A valise of waterproof material has been produced by an English concern that is designed to be used as a small shelter tent and in an emergency can be used as a bath. It consists of a tapering body which, when unfolded, is long enough to shelter one man. Pins are provided at the two corners at the narrow end by which it is fastened to the ground. At the wide end two short posts are inserted in eyelets to distend the tent fully as well as hold it in place. The upright wall at this end is composed of flaps which supply an opening to the tent; the upper flap may be drawn out by means

of ropes to serve as a canopy over the head of the occupant. By fastening the lower flap in a vertical position

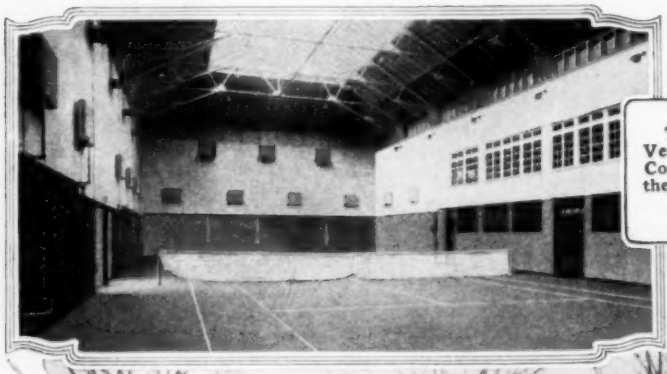


A Bag Which When Unfolded can be Set Up as a Tent and can be Used for a Bath in an Emergency

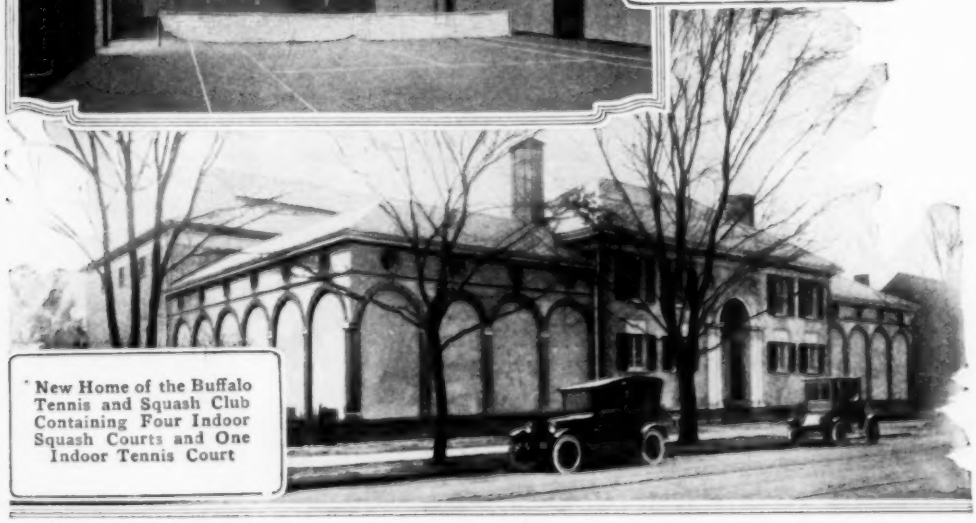
the tent becomes a sort of covered basin that can be partly filled with water for a bath or for other camp purposes.

CLUBHOUSE HAS FIVE INDOOR COURTS

A clubhouse possessing a number of unusually attractive features was opened recently by the Tennis and Squash Club of Buffalo, N. Y. The building is a three-story structure of brick and stucco. Its central portion is occupied by social rooms and the remainder by indoor courts. Opposite the street entrance is the tennis court of regulation size. At each end of the clubhouse, alongside the street, are two squash courts—two for men and two for women. These courts are electrically lighted so that they can be used at any hour. Ventilators high up on the walls connect with the outdoors. At stated periods an electric bell rings in each court as a signal for players to give possession to new arrivals. On the second floor is a reception room which looks down on the tennis court. There is also a kitchen which adjoins a men's parlor and a women's parlor. The men's room overlooks the men's squash courts and the women's room the other courts.

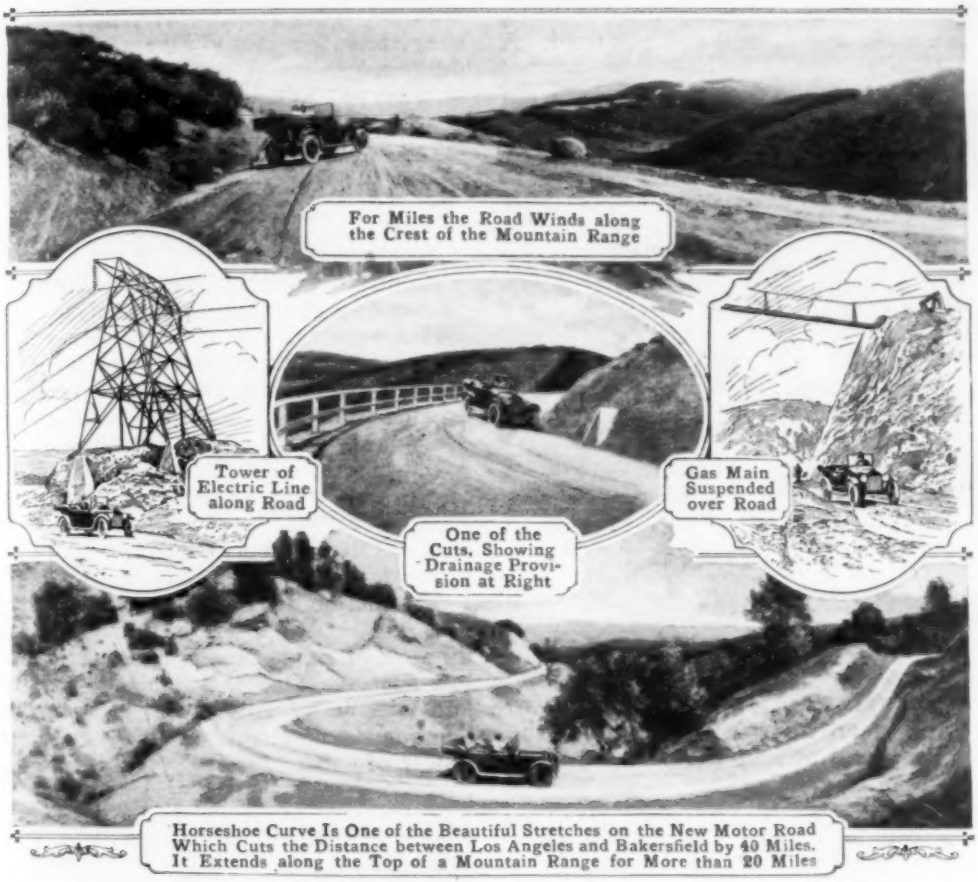


The Well-Lighted and Ventilated Indoor Tennis Court: Upper Windows on the Right Open on a Large Reception Room



New Home of the Buffalo Tennis and Squash Club Containing Four Indoor Squash Courts and One Indoor Tennis Court

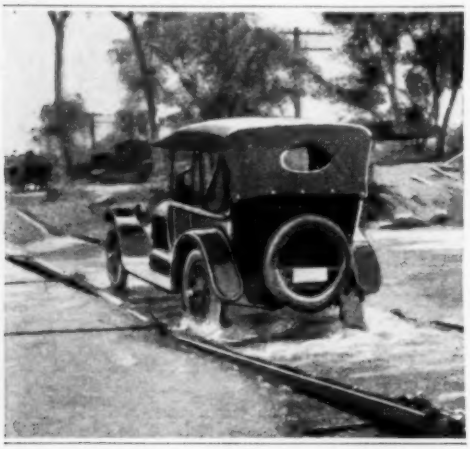
MOUNTAIN-TOP ROAD OPENED IN CALIFORNIA


For Miles the Road Winds along the Crest of the Mountain Range
Tower of Electric Line along Road
One of the Cuts, Showing Drainage Provision at Right
Gas Main Suspended over Road

Horseshoe Curve Is One of the Beautiful Stretches on the New Motor Road Which Cuts the Distance between Los Angeles and Bakersfield by 40 Miles. It Extends along the Top of a Mountain Range for More than 20 Miles

Quite an interesting piece of highway construction is represented in the Ridge Road, opened last spring, which gives California motorists a much more direct route between Los Angeles and Bakersfield than has been available in the past. The thoroughfare constitutes a new section of the Tejon Road that connects southern California with the San Joaquin Valley. Formerly, by this road, the two cities were 160 miles apart. The distance has been cut to 120 miles by the establishment of the Ridge Road, which is a 30-mile short cut connecting two points on the old pass. At the place where the new highway diverges from the Tejon Road it rises from an elevation of 1,000 ft. to one of 5,300 ft. and then extends along the crest of a mountan range for more than 20 miles. After this it drops down to a lower altitude and joins into the former artery. A magnificent view of hill and valley for miles in all directions is afforded at every point along the mountain-top route. The roadway is smooth, its turns banked, none of its grades steeper than six per cent, and its width in no place less than 21 ft. At first the road was merely graded and oiled. During the present summer, however, it is to be concreted or macadamized. This part of the construction was postponed in order to let the fills settle before a permanent surface was applied. The highway is so nearly an air line that it practically parallels an electric transmission system and

gas-pipe line. During the rainy season when it was difficult to haul fuel for the steam shovels working on the road, the main was tapped and gas used. A



Temporary Floating Bridge Prevents Cars from Miring in Sand of Shallow Santa Clara River on the Ridge Route

half million dollars has already been spent on the project and another $250,000 will be necessary to finish it. A motor-stage line using the new route carries passengers between the two cities in an hour less time than the railway and at half the cost.

NAVY'S HEAD SENDS ORDERS BY WIRELESS TELEPHONE

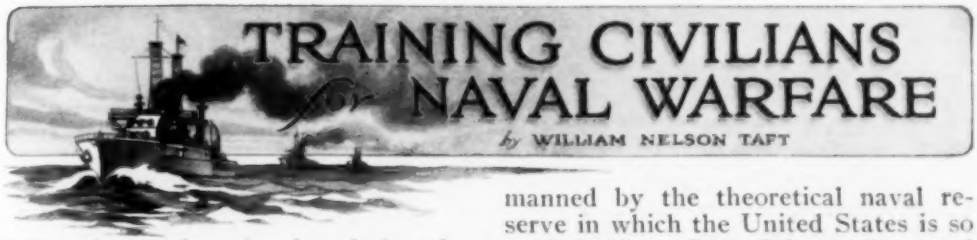
A few weeks ago Secretary Daniels sat in his office in Washington and talked by wireless telephone with the commander on the bridge of a warship off the Virginia coast. This historic incident marks the inauguration of a system of wire and wireless communication which has been under construction for a year and which gives the Army and Navy departments facilities of communication that are said to be unequaled by any other nation. The test covered three days and included a conversation between the commander of the Great Lakes, Ill., naval training station and the commander of the "New Hampshire," who was on his vessel in Chesapeake Bay. The latter's message was, "It is a wonderful achievement to be able to talk from Great Lakes to a vessel at sea connected through Washington by wireless telephone." While making the trials the Navy Department endeavored to reproduce actual war conditions, and in ordering the movement of warships, forces, etc., all was undertaken as if a real enemy existed.

STEEP INCLINE AT PANAMA CLIMBED BY MOTORCYCLE

As an indication of the hill-climbing ability of certain high-powered motorcycles, a rider of a well-known domestic machine recently amused himself and thrilled bystanders by riding up and down a sharp incline at the Gatun locks of Panama Canal. The path is a narrow, smooth, concrete runway bordering a cog track over which the big electric "mules," used in towing ships through the passage, climb to reach the upper level.

The incline has a grade of about 45°. The motorcyclist made this climb a number of times on high, second, and low speeds. This was done both with and without a tandem passenger, and demonstrates strikingly the reserve power of some of these machines.

Climbing to the Top of the Gatun Locks at Panama Canal on a Motorcycle to Demonstrate the Machine's Reserve Power

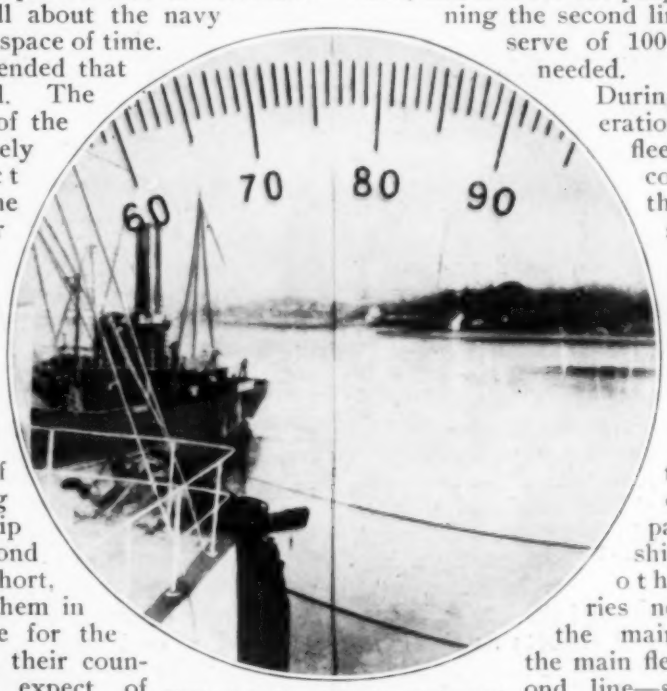


TRAINING CIVILIANS for NAVAL WARFARE

by WILLIAM NELSON TAFT

IN order to lay the foundation for the naval reserve of 100,000 men, which military experts assert is essential to the proper defense of the nation in the future, the Navy Department will undertake during the months of August and September, for a period of four weeks, a training cruise designed to instruct some 4,000 civilians, of all classes of life, in the duties of the modern man-o'-war's man.

It is not expected that the civilians will learn all about the navy in this short space of time. It is not intended that they should. The purpose of the cruise is merely to instruct them in some of the minor aspects of war at sea, to teach them how to construe and obey orders, to give them an idea of the handling of a warship of the "second line"—in short, to prepare them in some degree for the work which their country would expect of them in the event of a war.



Field of Vision through a Submarine Periscope, One of the Apparatus with Which Civilians will Become Familiar

Eight battleships of the reserve fleet have been assigned to the naval-training cruise. Each of these vessels will carry 500 civilians, in addition to its nucleus naval crew of 300 officers and men. The ships to be used are those which would, in war time, be assigned to the second line of defense, to be manned by the theoretical naval reserve in which the United States is so sadly lacking. Indeed, it may be stated that there is no "reserve," in the sense in which this word is officially understood. It is true that the nation could count upon the services of some 8,000 members of the Naval Militia and about 2,000 former enlisted men and retired officers of the navy—the Naval Reserve, so called. But, in the event of war, these men would be assigned to the main fleet, the "first line" of defense, and it is for the purpose of manning the second line that a reserve of 100,000 men is needed.

During naval operations the main fleet would be composed of the battleships, battle cruisers (when these are built), destroyers, seagoing submarines, scouts, and the train of colliers, repair ships, oil ships, and the other auxiliaries necessary for the maintenance of the main fleet. The second line—scarcely less important than the first, in the opinion of naval experts—would include the raiding forces, coast patrols, mine layers, mine sweepers, coast-defense submarines, submarine catchers, motor dispatch boats, and the like. The navy is short nearly 20,000 men for its first line of defense. The second line is so weak that it may be said not to exist at all,

which is the reason for this naval-training cruise—the first to be held by any nation in the world.

The eight battleships carrying the civilian sailors will leave from six ports along the Atlantic coast—two ships from Boston, one from Narragansett Bay, two from New York, one from Philadelphia, one from Norfolk, and one from either Charleston or New Orleans—on August 15. From that date until September 12, the civilians on board will be given daily drill in the duties which would be expected of them in war time.

For two weeks they will be instructed in the rudiments of seamanship, under officers experienced in the handling of recruits and in company with trained sailors who are conversant with naval life. At the end of this fortnight of preliminary training, the squadron will proceed to Newport to take part in the annual "war game" in which the entire Atlantic fleet will participate. This will give the men a taste of actual fighting conditions, without the danger of the combat, and will train them for the duties which they will be expected to perform under fire.

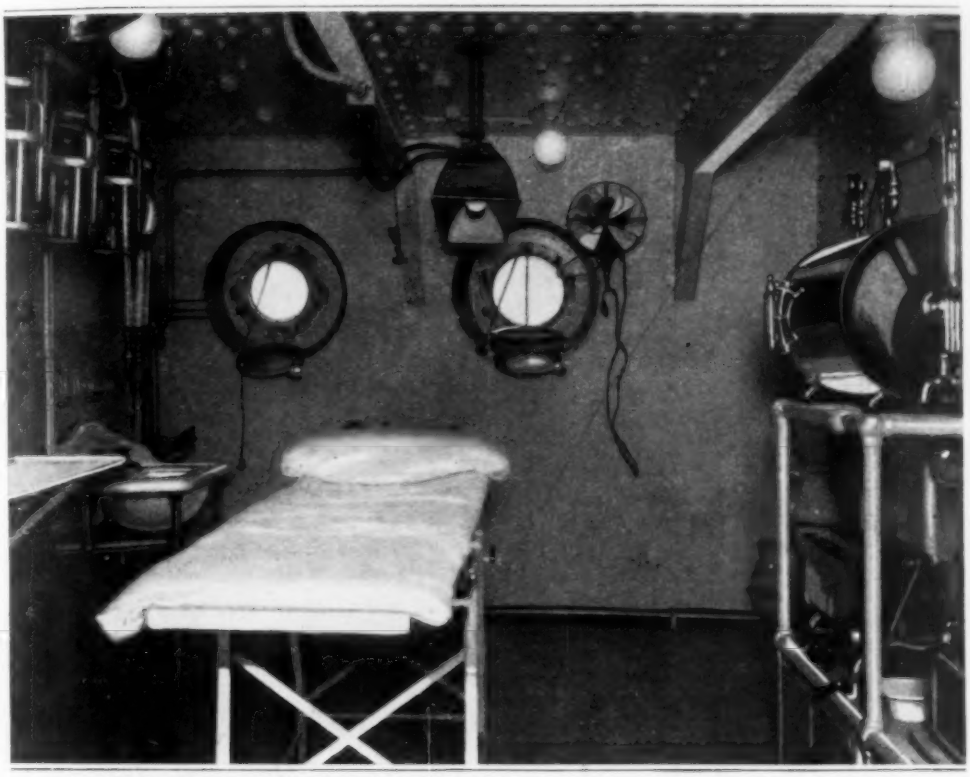
The war game, which will be held on a greater scale this year than ever before, will consume the third week of the cruise and at the end of this time the training ships will return to their home ports, where the men will work out problems of local defense with the aid of the coast artillery and the various motorboat organizations which the navy is recruiting.

This final week of the cruise is considered by naval experts as the most important of the entire four, inasmuch as it will round off the rough edges of the recruits and give them actual practice in the localities to which they would be assigned in time of war. For example, the vessel which starts from Norfolk will, at the conclusion of the war game, be stationed at Hampton Roads and the civilian sailors will obtain first-hand experience in the handling of the smaller units of the second line of defense—the mine sweepers, dispatch boats, submarine chasers, etc., which are so essential to the proper defense of the coast line. In this manner, the navy hopes to create the basis of a reserve which not only is conversant with its duties but is also familiar with the territory along which it will be expected to work. The department has secured the services of a large number of privately owned motorboats, and other small vessels, which will work with the training squadron during the second week of September.

In order to take the cruise, a man must be between the ages of 19 and 45; must pass a prescribed physical examination; must be a graduate or undergraduate of a college, university, technical or high school, or, in lieu of this, must "demonstrate to the satisfaction of the recruiting officer sufficient knowledge of maritime matters or experience with water craft to warrant enlistment." This latter provision, however, is very elastic, any one of the following qualifications being considered sufficient: pilot or pilot's apprentice; service on any merchant vessel (including fishing ships) in any capacity for six months or more; six months' experience as a machinist, boilermaker, plumber, shipfitter, carpenter, electrician, engineer, fireman, telegrapher, or radio operator. Application for admission must be made to an enlistment officer.

Upon receipt of word that the application has been granted the applicant will be instructed to report at the navy yard nearest his home, and, on August 15, will be expected to pack his ditty box and go on board ship. A deposit of $30 will be requested by the government, to cover the bare cost of uniform and mess during the month. Should the actual cost of board and outfit be less than the amount of deposit—as it probably will be—the difference will be refunded upon the return to the home port.

Before taking the cruise, recruits will be expected to signify their willingness to subject themselves to and be governed by the regulations of the



In Hospital Rooms of This Type Injured or Ill Civilian Sailors will Receive First-Class Care. This View was Taken on the U. S. S. "Florida"

navy, and to obey all instructions issued by duly constituted naval authority. For grave or repeated infraction of the rules, the commanding officer will be permitted to land the delinquent at the nearest port. That no applicant for the cruise may be ignorant of the hours of service aboard ship, the Navy Department has taken care to issue a schedule of warship life, commencing at 5:30 o'clock in the morning and concluding at 9 o'clock at night.

Ample opportunities will be provided in the course of the day's routine for specialization in different branches of naval work. In addition to instruction in signaling, navigation, radio work, steam and electrical engineering, there will be boat drills, gun drills, torpedo practice, military formations, and the manual of arms. The time devoted to each subject will necessarily be brief, but it is the belief of the officials of the Navy Department that the maturity and degree of intelligence of the recruits will be such that they can grasp the details very rapidly, and that the first naval-training cruise will turn out 4,000 men, well grounded in the essentials of sea fighting and well equipped for the defense of the nation in the future.

RACE HORSE BREAKS NECK IN THRILLING CHASE

During the spectacular Timber Toppers Champion Chase of the United Hunts Meet, held recently at Belmont Park Terminal on Long Island, "Impulsive," one of the 15 entries, fell and broke his neck. Throughout, the race was unusually thrilling and intense. In addition to the fatal accident, which nearly cost the life of the rider, there was upset after upset. For the first mile the chase went smoothly. After

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Unusual Photograph Caught at the Instant "Impulsive" Plunged Headlong to the Turf, Killing Himself

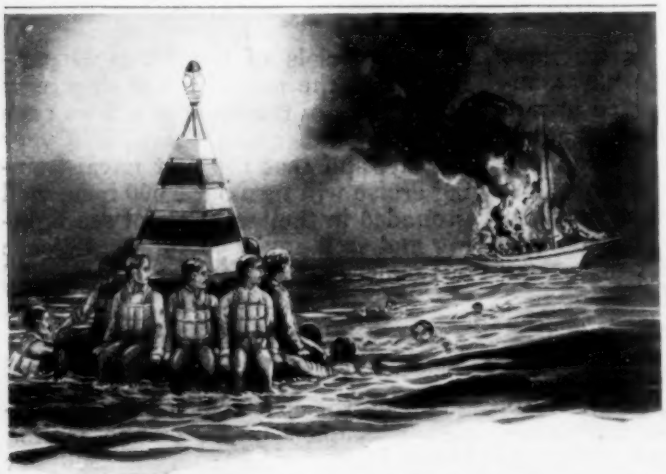
that the pace was stiffened and every jump drew a cheer and every fall the cry, "Another's down!" On the third time around "Impulsive" came up among the leaders, running in good form. But when he attempted to take a fence almost in front of the judges' stand he caught in his jump, failed to recover, and lunged almost perpendicularly to the turf, striking on one side of his neck and killing himself.

PATRONS SHAVE THEMSELVES IN NOVEL BARBER SHOP

A barberless barber shop was opened recently in Chicago. In this new shaving parlor each patron shaves himself. He is assigned to a booth in which he finds soap, razors, brushes, towels, powder, toilet lotions—in fact everything with which to give himself a good shave. There is little or no waiting in this shop and no one is eligible for tips.

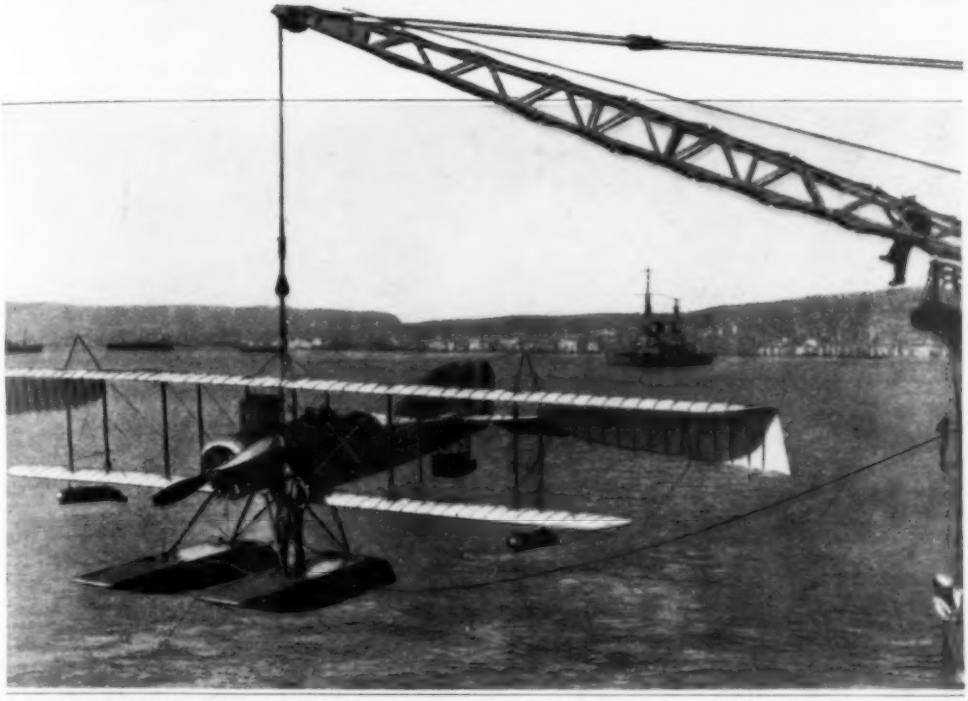
MEN CLING TO BEACON BUOY WHILE YACHT BURNS

Sixteen passengers and the crew of the motor yacht "Onawanda" survived a thrilling experience recently when that vessel burst into flames on Tampa Bay near the mouth of the Manatee River. The craft was returning from Bradentown to St. Petersburg, Fla., with a party of Odd Fellows when fire was discovered shortly after midnight. It was impossible to extinguish the blaze, and every one was forced to don life preservers and take to the water. The men swam to a channel buoy a half mile away, guided by its beacon. There was room on this for only half of the number, so turns were taken, part of the men resting while the others remained in the water and held to the floater. After about six hours of this, the party was rescued by the steamship "H. B. Plant." Although some of the men were ill as a result of their exposure, none was injured. In memory of their experience they have formed a closed organization called the Pelican Club. This name was chosen because of the practice of these waterfowl to sit on channel buoys and sun themselves.



Half of the Men Remained in the Water While the Others Rested on the Buoy. After Taking Turns in This Way for Six Hours They were Rescued

LAUNCHING FLYING BOAT FROM BRITISH WARSHIP



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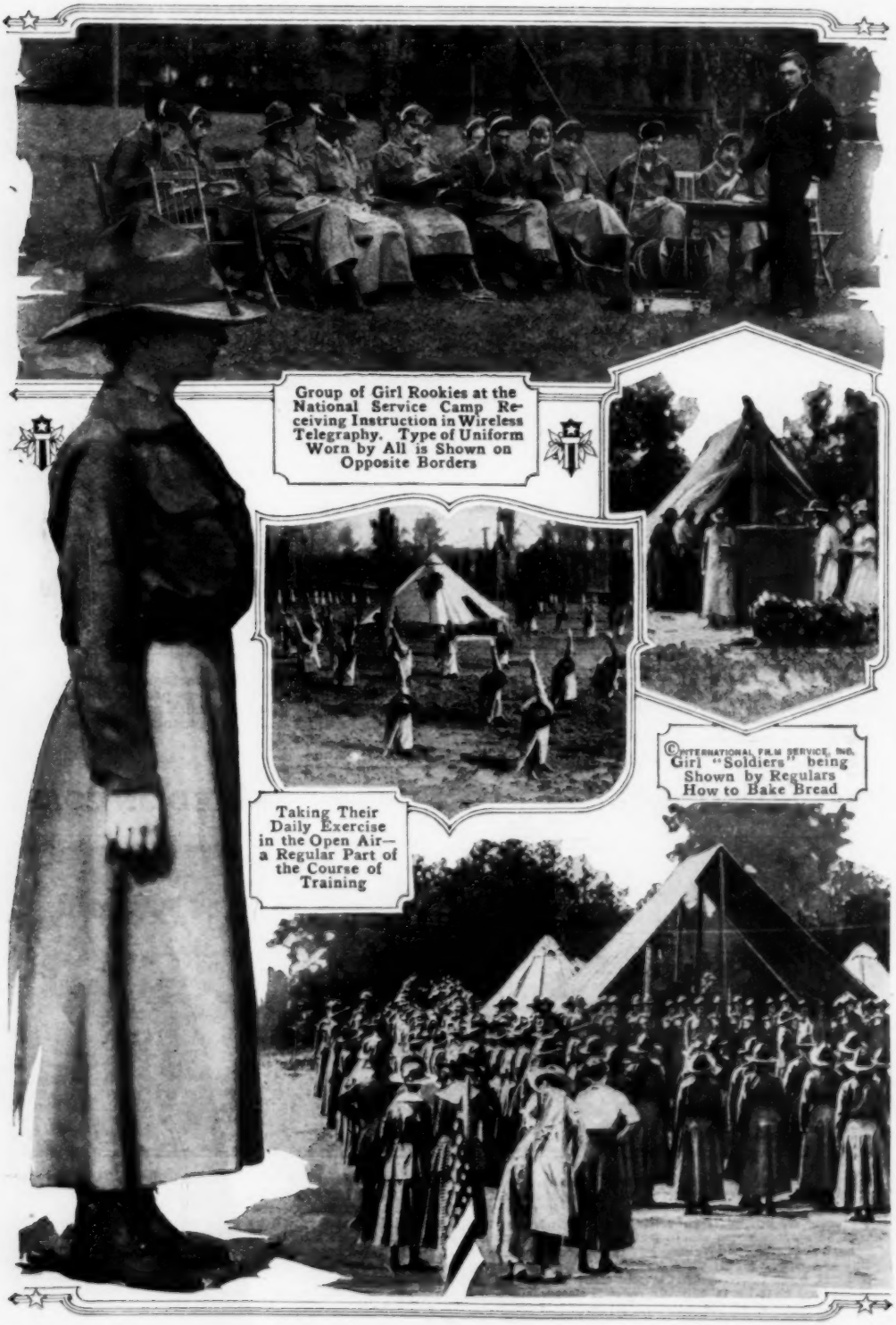
ONE of the "eyes" of the British fleet stationed in the harbor at Saloniki: This photograph shows a naval flying boat being lowered to the water from the deck of a battleship. Air craft have proved themselves to be as indispensable in naval warfare as in land operations during Europe's great conflict, and while in the past few vessels were equipped with them, now every fleet has its corps of airmen. The machine pictured here is being made ready for patrol duty.

NEW HIGH-HURDLE RECORD ESTABLISHED ON COAST

IN a thrilling, hard-fought race against title holders on the Stanford oval at Palo Alto, California, Earl Thomson of the University of Southern California ran the 120-yard high hurdles in 14 4-5 seconds, May 13. The time is official and equals that made the week previous by Robert Simpson of the University of Missouri. It is understood, however, that the latter runner was without official timers, which undoubtedly means that Thomson will be awarded the world honors. Heretofore the time for the high hurdles has stood at 15 seconds flat, a record that was held by two of the contestants entered in the spirited race against the new champion. The winner finished easily a full yard ahead of his closest rival, who, until the last hurdle was reached, had led him. He did not once touch a hurdle and showed throughout such unusual form and strength that the belief has been expressed that he is capable of still better time. Thomson is only 21 years of age and runs with a long, low stride. Above, at the extreme right, he is shown taking the final hurdle.

KHAKI-CLAD GIRLS AND WOMEN, SOME OF SOCIAL



Group of Girl Rookies at the National Service Camp Receiving Instruction in Wireless Telegraphy. Type of Uniform Worn by All is Shown on Opposite Borders

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Girl "Soldiers" being Shown by Regulars How to Bake Bread

Taking Their Daily Exercise in the Open Air—a Regular Part of the Course of Training

PROMINENCE, TAUGHT HOW TO BE USEFUL IN WAR

The Women are Shown Here Lined Up before Their Tents for Inspection: Military Discipline is Rigidly Enforced and Every One Shares Alike in the Work

© INTERNATIONAL FILM SERVICE
A Washington Girl Operating the Key of a Field-Telegraph Instrument

© INTERNATIONAL FILM SERVICE, INC.
Women, Who in Daily Life Drive Their Own Cars, Make Good Motor-Truck Chauffeurs

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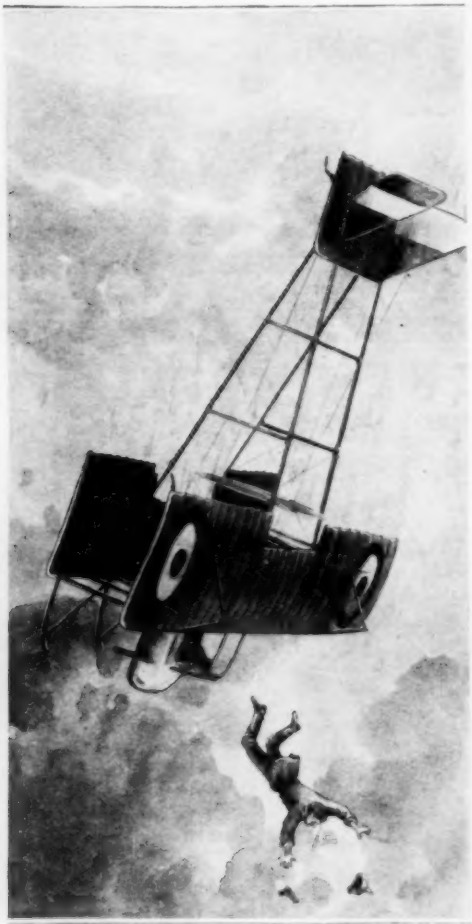
Lowering the Colors at Sunset in Camp near Chevy Chase. Girls from Various Parts of the Country are Taught Telegraphy, First Aid, Signaling, Food Conservation, and Sanitation, to Make Them of Value in Case of War

FRENCH FLIER'S QUICK WIT ENABLES HIS ESCAPE

A French airman's escape from the hands of the enemy after making a forced landing back of the German lines forms one of the most unusual incidents of the war. During a reconnaissance flight the pilot, who is commissioned as a major, was caught in a thick fog and lost his bearings. Upon reaching the ground he was taken prisoner. Shortly afterward he was strapped into his craft and ordered by a German officer, who took the observer's seat behind him, to fly low over the French lines but not to signal his comrades nor to land. To enforce his orders the German carried a revolver in one hand. Once in the air, his wits working, the pilot made a swift ascent to a safe height, suddenly turned the nose of his craft toward the earth and dived. The unwelcome passenger had not taken the precaution to strap himself in, and the Frenchman was keenly aware of it. As a result he was catapulted out of the machine and fell to his death, while the airman looped the loop and flew to his base. It is impossible to corroborate this story, but the feat could have been accomplished easily and seems entirely plausible in view of the many incredible things which are happening daily at the front.



The Enemy was Hurled from His Seat into the Air While the Pilot Looped the Loop and Flew to the French Lines

EXHAUST GASES FROM MOTOR SOURCE OF DANGER

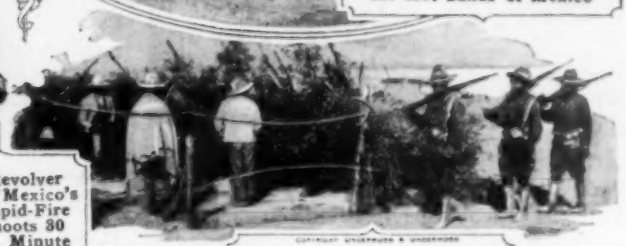
On different occasions Popular Mechanics Magazine has called attention to the danger one is subjected to by inhaling the exhaust fumes of internal-combustion engines. The growing number of motor cars has made this a widespread danger and fatalities due to it are apparently increasing. In small private garages, when an engine is running, the chances for asphyxiation are greater than elsewhere, unless very good ventilation is provided. Incomplete combustion of the carbon present in gasoline produces carbon monoxide. This is a highly poisonous, odorless, and colorless gas which readily combines with the hæmoglobin of the blood, expelling oxygen and frequently causing very quick death. The effects of the gas are most noticeable in the wintertime, for the reason that during cold weather one frequently works over, or tries out, an engine while the doors and windows of a garage are closed. The fumes are thus confined and occasionally carbon monoxide is present in large quantities. When this is the case the danger is extreme. At all times pains should be taken to provide adequate ventilation; this is the best means of insuring against accident and possible death.

GRINGO AND GREASER IN QUEST OF VILLISTAS

Military Funeral of 6th Infantry Trooper Who Died in Camp on Mexican Soil. The Coffin is being Lowered into the Grave

Member of Medical Corps Examining Soldiers' Feet at End of an All-Day Hike across the Hot Sands of Mexico

The "Revolver Cannon," Mexico's New Rapid-Fire Gun, Shoots 30 Shells a Minute

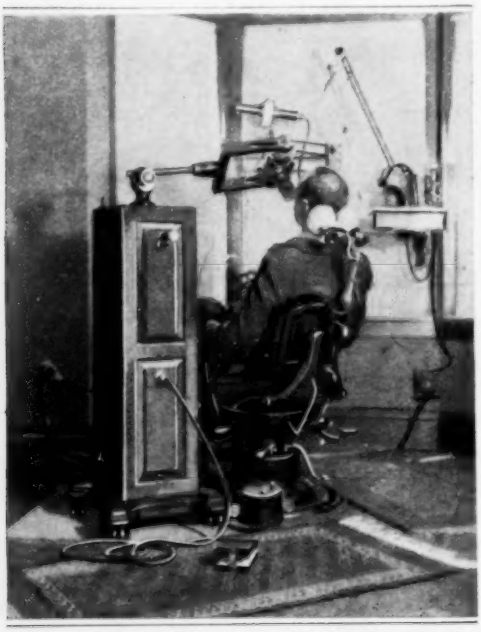


Some of the Columbus Raiders under Guard in Stockade at Namiquipa, Mexico

Troop Train Loaded with Carranza Forces En Route to Different Points in Search of Villa's Band of Outlaws: Here They are Passing through an American Expeditionary Camp

SPECIAL X-RAY APPARATUS AN AID TO DENTISTS

A compact, easily operated X-ray apparatus designed especially for dental work is now employed by dentists in determining whether or not root canals have been properly filled, and in locating infected areas, unerupted or impacted teeth, pyorrhea, etc. The thoroughly reliable information which this equipment makes available for the dentist often enables him to avoid serious mistakes in treating teeth. Formerly the use of the X-ray for dental work involved buying bulky and expensive apparatus and called for special skill on the part of the operator. A feature of the new outfit is its compactness and simplicity. The special X-ray tube employed is of lead glass having a window of sodium glass through which the rays emerge and pass through a lead-glass extension that carries an aluminum filter. This extension is placed against the patient's face and enables the operator to tell accurately the direction of the rays in relation to the part being radiographed. After the tube has been properly placed and a small dental film put in the patient's mouth, the operator presses a floor switch for one or two seconds. The film is then removed and can be developed at once either in a dark room or in a special developing machine. Within 10 minutes the dentist may know the condition of the teeth he has radiographed. An excellent feature which the makers claim for this X-ray tube is that it is self-regulating, thereby saving the operator's time, avoiding breakage, and insuring uniformity of results.



A Compact X-Ray Equipment with Which a Dentist can Quickly and Easily Make Radiographs of the Teeth

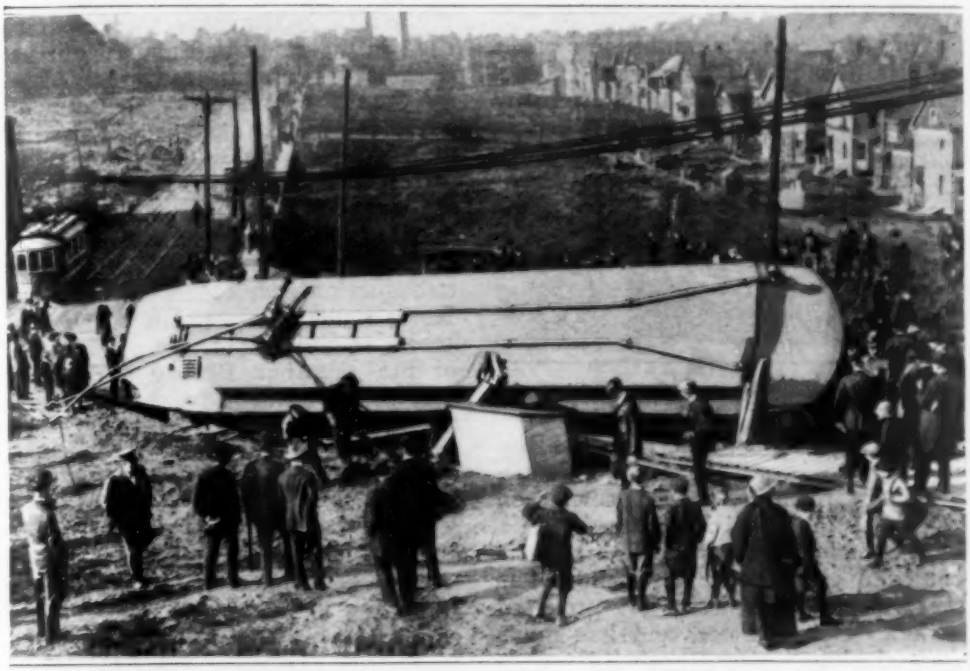
Right: Dark Area at Left Impacted; X-Ray Revealed Condition and Location; Pivot Tooth Seen at Right

Left: The Long Dark Line on the Right Is a Root Filling Which Extends Too Far and would Have Caused Much Suffering

BRONZE PAINT THAT WILL SERVE AS A CONDUCTOR

A method now employed to make bronze paint a conductor of electricity is to treat it with hydrochloric acid. It is supposed that ordinarily the bronze particles are covered with a thin nonconducting coating and it is this which is overcome by the treatment. The paint should contain equal parts of amyl acetate and acetone and four per cent of transparent celluloid. After it has been applied and is partly dry it will act as a conductor if it is rubbed with strong hydrochloric acid. By exposing the freshly painted surface to the fumes of hydrochloric acid, the same result can be obtained. A ready-made paint that will serve as a conductor can be secured by properly mixing bronze powder, amyl acetate, and concentrated hydrochloric acid and then adding and decanting water and ethyl alcohol, in turn.

MANY HURT IN CINCINNATI STREET-CAR WRECK



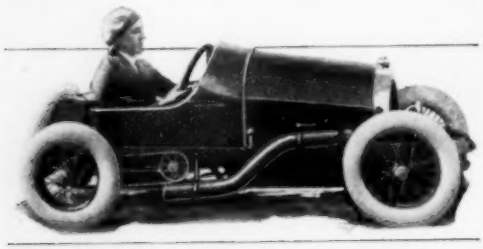
SEVERAL deaths and many injuries resulted recently when a Cincinnati surface car loaded with passengers raced pell-mell down a hill and turned over on one side. It was another instance of the brakes failing to work. The car became unmanageable when it started down grade. Before it reached the bottom of the five-block hill it was running at great speed, every effort of the motorman, and a number of passengers who tried to help him, failing to check it. Unfortunately there is a sharp curve at the base of the incline where the accident occurred. When the car reached this it jumped the track, turned over, and slid. More than 40 persons were in the carrier at the time of the tragedy. No one escaped injury.

WEIRD ENTREATY TO PEOPLE MADE BY BELGIAN MAYOR

One of the strangest and most weird public appeals that has been made during modern times in a civilized country recently emanated from a Belgian magistrate. It is pathetic in tone and startling, being a serious prayer that any subject determined upon suicide use either poison or a rope in ending his life. The reason for this remarkable utterance is to be found in the regulations imposed by the German authorities in Belgium. At the time the country was formally occupied by the enemy, orders were issued that all firearms in the possession of the inhabitants be turned over to the proper officials. Severe punishment was provided for those failing to obey the command. Naturally many individuals complied with the ruling, while others evaded it. Now, however, it is asserted that whenever a firearm is found by the authorities, the owner, if he can be located, is imprisoned and the community fined for his misdemeanor. Some time ago a man who had been instrumental in bringing about the execution of Edith Cavell, the English nurse accused of aiding her countrymen, was shot to death. Although the perpetrator of the deed was not apprehended, a heavy fine was levied upon the city of Brussels. More recently a man in a small village killed himself with a gun. The community is reported to have been fined $2,500—a staggering sum to townsmen in the starving village. And it was the mayor of this place who posted the public announcement directed to those contemplating suicide.

TINY MOTOR CAR IS DRIVEN BY AERIAL NAVIGATOR

One of America's exhibition airmen, who is now in the limelight, drives a miniature racing car of his own manufacture when he is not looping the loop in the clouds. The machine has a pleasing streamline body, is carried on elliptic springs, and is powered with a twin-cylinder motorcycle engine. It is equipped with electric lights, has three-speed transmission, is provided with a "kick" starter, and has made a speed of a fraction less than 50 miles an hour on a half-mile track. The tires are the same as those commonly used on the landing gear of aeroplanes.



This Diminutive Speedster was Built by Its Driver, a Popularly Known Young Airman

GOVERNMENT WORK SHOWN BY SAFETY-FIRST TRAIN

What the government is doing to protect the lives and property of its citizens was recently brought home to thousands of persons in cities visited by a safety-first train sent out from Washington. This was an all-steel 12-car special supplied by the Baltimore & Ohio Railroad, containing exhibits prepared by various Federal departments and attended by their representatives. The purpose of the tour was to spread information to many of those who have never visited Washington nor have been able to take advantage of exhibits maintained at world's fairs and expositions, concerning the government's varied activities in the interests of personal and public safety.

Different cars were devoted to separate subjects. The Treasury Department, for instance, prepared an exhibit which presented the work of the Coast Guard and Public Health services. Models of instruments and apparatus used in the army and aboard our battleships and submarines were displayed by the War and Navy departments, while the Department of the Interior in a similar way illustrated how the Bureau of Mines looks after the safety of more than a million men engaged in that industry, and gave comprehensive information about the activities of the Reclamation Service, which is causing desert and other waste lands to become habitable and productive. The works of the Weather Bureau and Forest Service were shown by the exhibits of the Department of Agriculture. The endeavors of the Interstate Commerce Commission and the Red Cross Society were also made clear, and in a most interesting way. Such things as machine guns, naval rifles, breeches buoys for life-saving at sea, wireless apparatus in operation, mine-rescue paraphernalia, and many of the safety appliances for transportation service that have been approved by the government were displayed, and their construction and operation explained to questioners by experts.

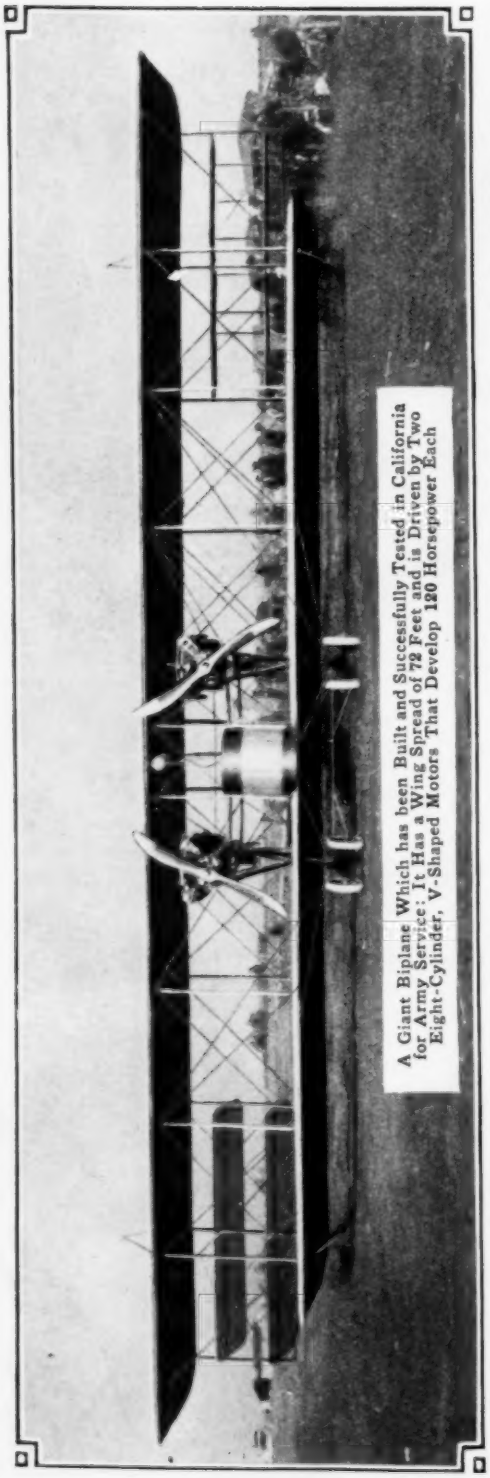
After being inspected by President Wilson, his cabinet, officials of the railroad, and others, the train left Washington to tour Pennsylvania, Delaware, Maryland, and West Virginia. So much interest was aroused by the exhibits that the itinerary was finally extended to include Kentucky, Ohio, Indiana, and Illinois. In the evenings, at the towns where the train stopped, motion pictures were exhibited and lectures given to explain in detail the efforts of the various Federal departments and bureaus which aim to conserve the lives and property of American citizens. The idea of sending out the train through some of the states was an outgrowth of the Safety First Congress held at Washington, and its success has suggested the advantage of maintaining a permanent exhibit of the kind, although it is not known that any steps are being taken to bring this about.

Machine and Rapid-Fire Guns, Torpedoes, Models of Large-Caliber Rifles, and Other Apparatus Constituted the Navy Department's Exhibit

The Work of the Forest Service in Supervising and Guarding Our National Reservations was Made Clear to Those Who Visited Its Car

Military Equipment of Various Kinds was Displayed by War Department: This Car Held the Exhibit of the Army-Engineering Service

Interesting Showing of the Paraphernalia Used in Mine-Rescue and First-Aid Work, the Exhibit Presented by the Bureau of Mines



A Giant Biplane Which has been Built and Successfully Tested in California for Army Service: It Has a Wing Spread of 72 Feet and is Driven by Two Eight-Cylinder, V-Shaped Motors That Develop 120 Horsepower Each

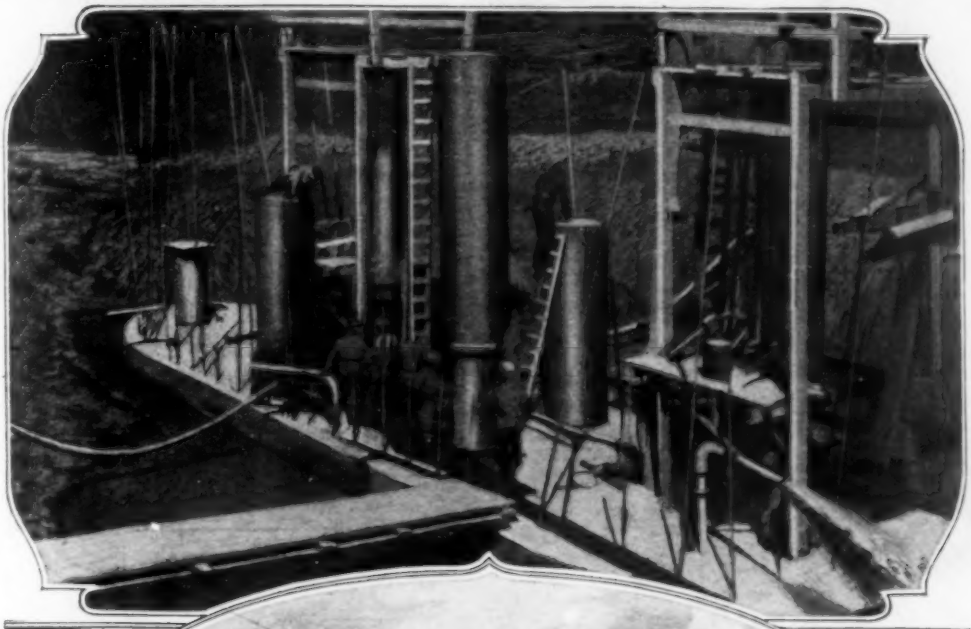
NEW CRUISER AEROPLANE FLIES IN THE WEST

A cruiser aeroplane, in size a rival of the "America," which was built to fly across the Atlantic, has been completed and has been used in successful flights in California preliminary to being tested for army service. The biplane has a wing spread of 72 ft. and is 40 ft. long; it weighs 5,000 lb. and has 975 sq. ft. of lifting surface, which is about 175 sq. ft. in excess of the "America's." The craft is equipped with two eight-cylinder, V-shaped engines which develop 120 hp. each. Each engine has a double ignition system, as a special precaution against ignition trouble. When in the air one motor is sufficient to propel the aeroplane. Approximately 400 miles is its flying radius; it carries tanks for 1,050 lb. of gasoline, one operator, one observer, and 800 lb. of useful load; its speed is 65 to 70 miles per hour. The airman's entire tool kit consists of a single double-"S" wrench which will fit every nut on the entire plane and on the engines.

DATA FOR PROSPECTIVE SETTLERS IN ALASKA

An interesting and valuable circular has recently been issued by the Department of Agriculture containing information for prospective settlers in Alaska. It is stated that the agricultural area of Alaska, mainly the interior valleys, is as large as the combined areas of Pennsylvania, Maryland, Delaware, New Jersey, Connecticut, Massachusetts, Vermont, and New Hampshire, and that it is capable of supporting nearly as large a population as that supported by the agricultural products of those states. Special consideration is given to the Matanuska River Valley, through which the new government railroad will run. The circular answers many questions as to climate, ways of obtaining a farm, crops, school facilities, cost of transportation, and similar matters of direct interest to prospective settlers.

ENORMOUS CAISSONS USED IN BUILDING BRIDGE



Upper View: The First Pier Landed, Showing the Top of the Caisson with Its Various Communication and Material Shafts

Towing One of the Big Caissons to the Bridge Site: Its Size may be Appreciated by Comparing It with the Stern-Wheeler at the Rear

Quite a noteworthy engineering feat is being accomplished in erecting a bridge over the Ohio River between the Kentucky and Illinois shores at Metropolis, Ill., by the Chicago, Burlington & Quincy Railroad. The structure will provide a new outlet to the seaboard and replace a car-ferry system by which the line has for some time made connections with the Nashville, Chattanooga & St. Louis Railroad. The bridge will have a total length of approximately 5,700 feet. It will consist of four 550-ft. and one 720-ft. fixed spans, one 300-ft. through span, one 250-ft. deck span, and about 2,200 ft. of plate-girder approach. The most interesting parts of the structure, however, are its foundations. These consist of seven pneumatic caissons, upon which the piers are founded, 66 by 110 ft. in size and sunk 75 ft. below the water. They are among the largest ever used in America, each being as big as a fair-sized business building. They were built on the river, floated to their proper positions, and sunk. The range between the high and low-water levels at this point is approximately 53 feet, and, because of this, piers 175 ft. in length have been employed. The approach to the viaduct on the Kentucky side will be a fill containing more than 1,000,000 cu. yd. of earth.

REBEL NEWSPAPER AND DUBLIN'S BATTLE SCARS

IRISH WAR NEWS

STOP PRESS!

THE IRISH REPUBLIC

MORE PIRACY

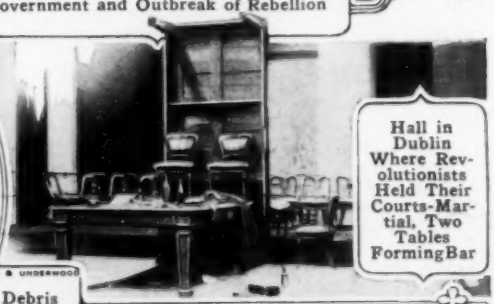
IRISH WAR NEWS

THE IRISH REPUBLIC.

"IF THE GERMANS CONQUERED ENGLAND."

First Issue of "The Irish Republic," Official Mouthpiece of the Rebels, Announcing Establishment of Provisional Government and Outbreak of Rebellion

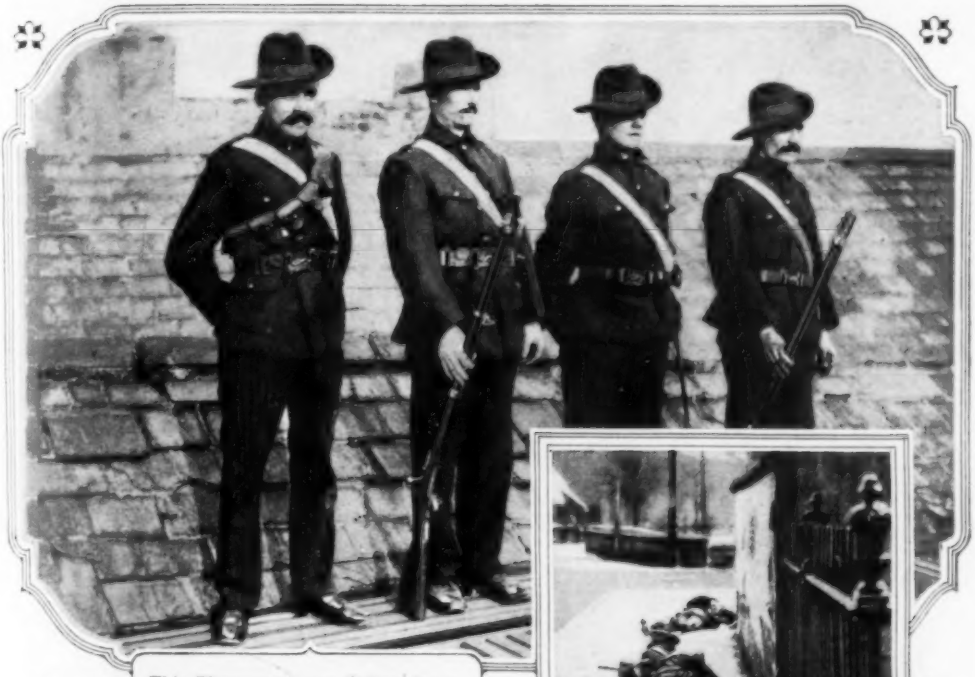
Removing Debris from Shell-Torn Sackville Street, Where Fighting Was Hottest



Hall in Dublin Where Revolutionists Held Their Courts-Martial, Two Tables Forming Bar

Wrecked Interior of the Dublin Post Office After the Revolutionists had Made Stand and Surrendered to the British Forces

WHERE IRISH REVOLT WAS PLOTTED AND KILLED



This Photograph was Taken by a Rebel Camera Man and Shows Four Uniformed Sinn Feiners on the Roof of Liberty Hall, Where They had been Detailed for Guard Duty, on the First Day of the Rebellion

British Soldiers Crawling across a Dublin Bridge to Attack Stronghold Held by Rebel Snipers

Ruins of Liberty Hall, Known as "Cradle of Irish Liberty," Where the Sinn Feiners' Uprising was Ostensibly Kindled: It Was Here Also That the Rebels Held Out against the British Forces until Routed by Artillery Fire

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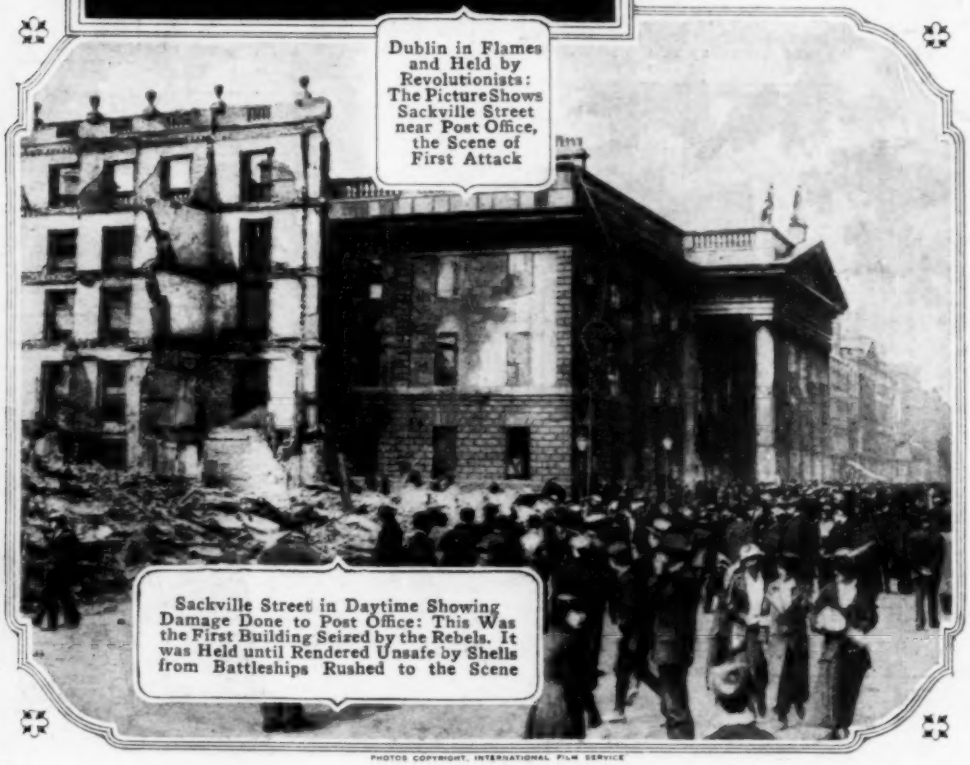
RESULTS OF SINN FEINERS' FIERY UPRISING

Band of Sinn Feiners, Captured by the British, Arriving under Guard at Knutsford: It will be Noticed That Some of the Prisoners in the Foreground Are Mere Youths

Dublin in Flames and Held by Revolutionists: The Picture Shows Sackville Street near Post Office, the Scene of First Attack



Sackville Street in Daytime Showing Damage Done to Post Office: This Was the First Building Seized by the Rebels. It was Held until Rendered Unsafe by Shells from Battleships Rushed to the Scene

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VARIED ASPECTS OF WAR TREATED PICTORIALLY

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Russian Soldiers in France: According to Certain Advices Some 10,000 Men in Civilian Attire were Landed as Serbian Refugees at Toulon Previous to the Arrival of the Large Contingent at Marseille. How Many of the Czar's Troops Are Now in France Is Unknown

British Women Who are Doing Men's Work: A Training Shop at Notting Hill Gate, Where Young Women are Instructed in Oxyacetylene Welding and Other Work Preparatory to Assisting in the Manufacture of Air Craft for the Military Forces

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Another Commentary on War: A French Boy, Still in His Teens, Filling a Man's Place at the Front

Weird-Looking Column of Moroccan Spahis on March in Argonne District, Where They are Engaged with the Allies against the German Forces. These Cavalrymen are Noted for Their Remarkable Horsemanship and Daring and on Several Occasions have Distinguished Themselves Notably

TYPES OF ALBANIAN FIGHTERS NOW AT WAR

Band of Volunteers on Way to Durazzo to Enlist in Army. Although Born Fighters, the Albanians Know Little of Modern Warfare

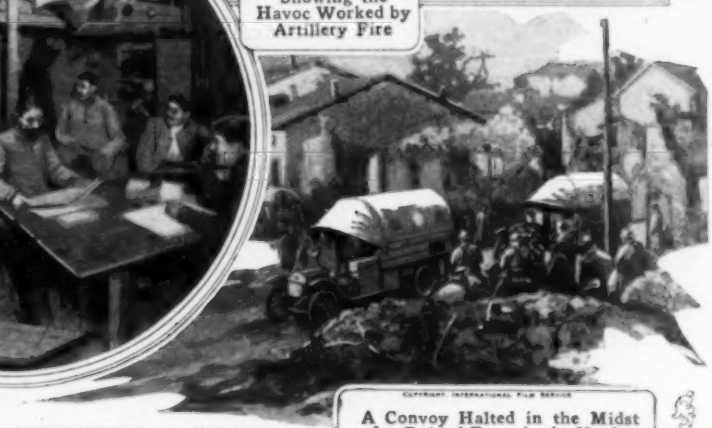
Transporting Mules on Barge across the Drin. Women Camp Followers are to be Seen in the Foreground

Tribal Chiefs in Conference: Europe's Conflict has Drawn Fighters from Albania and Quieted the Country's Revolution

VERDUN FRONT AFTER WEEKS OF BOMBARDMENT

This Gives a Glimpse of the Remains of Another French Town in the Western Theater, Showing the Havoc Worked by Artillery Fire

Subterranean Quarters near the Meuse: The Upper Part of the Walls is Lined with Seats for Soldiers off Duty



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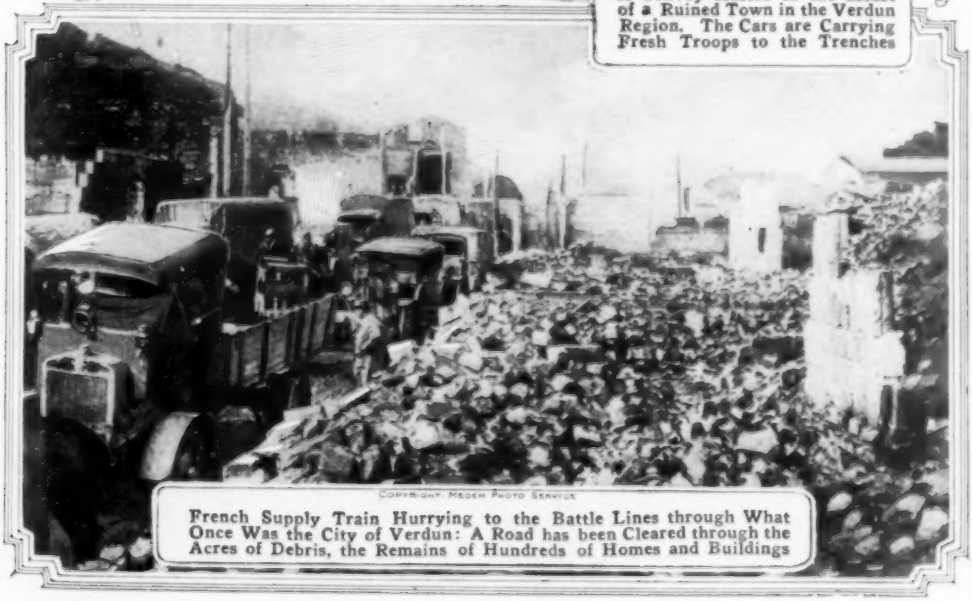
A Convoy Halted in the Midst of a Ruined Town in the Verdun Region. The Cars are Carrying Fresh Troops to the Trenches



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French Supply Train Hurrying to the Battle Lines through What Once Was the City of Verdun: A Road has been Cleared through the Acres of Debris, the Remains of Hundreds of Homes and Buildings

SIEGE OF FORT KARAGUBEK, KEY TO ERZERUM

Hardened Russian Fighters of the Caucasian and Siberian Forces Storming Fort Karagubek, the Most Formidable Position in Erzerum's System of Outer Defenses: After Suffering Unspeakable Hardships, Which Authorities Claim Few Other Troops could have Withstood, the Force was Drawn Up on the Crest of a Precipitous Slope Overlooking the Enemy Fortress Crowning an Opposite Mountain. When the Order to Advance was Given, the Men Slid in a Veritable Avalanche down the Frozen Mountain and Swarmed into the Zigzags That had been Cut toward the Turkish Defense. Then They Plunged Ahead in the Face of an Inferno of Shrapnel and a Snow-Laden Wind Which Blistered Their Skin. In About Five Hours the Russian Flag was Raised above the Battered Fortress

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RUSSIA'S GREAT MILITARY COUP IN ARMENIA

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Group of Turkish Soldiers Captured by the Victorious Russians When the Stronghold Fell: In All, 235 Officers and 12,753 Men were Made Prisoners, While Thousands were Killed

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One of the Imposing Gateways before Erzerum, the Massive Columns of Which were Somewhat Damaged during the Eight-Day Siege

Russia's Army of the Caucasus Made One of the Most Stupendous and Heroic Campaigns of the War When, in Dead of Winter, It Forged through the Icy Mountains into Armenia and Captured the City of Erzerum, Which had been Strongly Fortified by the Turks. Here the Russians are Shown in Their Herculean Task of Bringing Up Their Guns, Ammunition, and Supplies for the Final Assault

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SIDE LIGHTS ON AUSTRO-ITALIAN CONFLICT

Austrian Transport Column Forcing Its Way through Roadless District in Montenegro: Progress in These Regions Is Slow and Hard

Portable Movie Plant Used by Austrians for Entertainment of Their Soldiers in Isonzo District

Assemblage of Austrian Prisoners Attending Mass Conducted by Italian Priest at Udine

Bridge over Isonzo River Built by Italians after Razing of Original Structure by the Enemy

AERIAL WARFARE: AN ESSAY ON PREPAREDNESS

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Manning the Rifles upon the Approach of a German "Fokker." War in the Air Is No Longer Fictional; Europe has Found It an Uncanny Reality

PHOTO COPYRIGHT INTERNATIONAL FILM SERVICE

When an Air Craft Approaches the Battle Lines These Men Determine Its Identity, and if It Is an Enemy, Shells begin Bursting Immediately

German Aeroplane, Captured within the Allies' Lines, being Taken to Paris as a Trophy. It is Mounted on a Trailer with Its Wings Folded

Dropping a Dispatch to a British Patrol Boat: The Message is Tied to a Piece of Wood Carrying Ribbon Streamers

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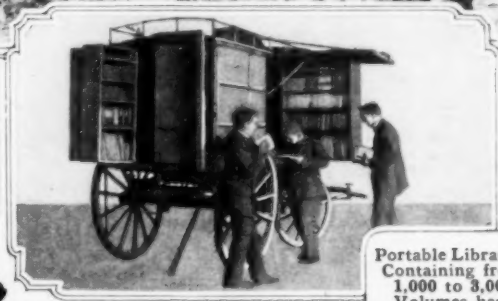
GERMAN INGENUITIES AND SUBTERFUGES IN WAR

Rolling a Muddy Field behind the German Lines on Western Front in Order to Provide the Airmen with Smooth Ground on Which to Start Their Machines



Portable Libraries Containing from 1,000 to 3,000 Volumes have been Sent to the Trenches for German Soldiers

Dummy Periscope, a German Ruse Which, According to Reports, has Proved Disastrous to the Enemy on Different Occasions: A Contact Mine Floats Below, and When a Ship Runs Down the Supposed Submarine It Strikes the Bomb

British Listening Patrol Caught by the Brilliant Glare of a German Light Rocket, Which Illuminates the Space between the Trenches for About a Minute. The Only Hope the Men Have Is to Fall Face Down and, if Possible, Avoid Detection

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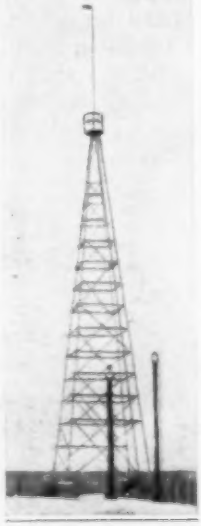
CENSUS SHOWS GROWTH OF MOTORCYCLE INDUSTRY

A preliminary statement of the 1914 census of the manufacture of motorcycles, bicycles, and parts, shows in comparison with the census of 1909 that while the number of establishments engaged in manufacture in these lines, from whom reports were received, has decreased from 122 to 94, the total value of their products has increased from $12,000,000 to over $25,000,000. During 1914, 62,000 motorcycles, valued at $12,300,000, and 398,000 bicycles, valued at $5,300,000, were reported as manufactured. In 1909 the output comprised 18,000 motorcycles, valued at $3,000,000, and 233,000 bicycles, valued at $3,200,000. In the earlier census, 27 firms reported the manufacture of motorcycles, bicycles, and parts, as subsidiary products; in 1914, the number of firms so reporting was reduced to sixteen.

STORM-WARNING TOWER ON CHICAGO'S PIER

At the outer end of Chicago's new municipal pier, which has already been described in Popular Mechanics Magazine, a steel tower, 85 ft. high, supporting a flagstaff which rises 25 ft. higher, has been erected for the purpose of displaying storm warnings to the boats that ply the lake. In fair weather no signals will be run up, but the approach of storms will be indicated in the daytime by the presence of flags and at night by three lights. The city and the United States Signal Service will by a special arrangement jointly maintain the tower.



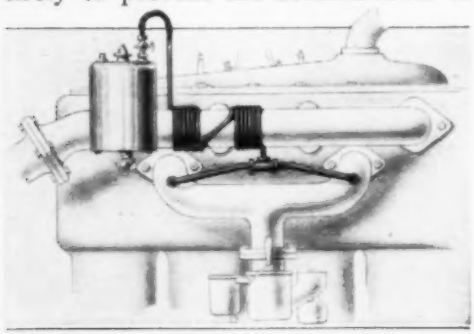
TENT FRAME AND SUSPENDED COTS COMBINED

A metal tent frame in which two cots are suspended when the outfit is set up, has been devised for campers who desire a substantial equipment that can be packed into small space. Fastened to the ridge pole by hinged couplings are four supporting members which form an "A" at the front and back. Their bases are connected by rods at the sides, front, and back. The entire framework, except the forward and rear base rods, which are of round iron, is of angle iron. Suspended from the supporting beams by heavy coil springs are two cots, one at either side; these have collapsible metal frames, across which canvas is stretched. The cots are 6 ft. 6 in. long and in the daytime can be folded back against the walls. The ridge pole extends a foot beyond the framework at either end, and the canvas is designed to be staked down 10 in. beyond the sides of the frame so that the cloth may have no unnecessary contact with the supports. The floor of the tent measures 11 ft. by 8 ft. 6 in. The entire outfit weighs 130 lb., including canvas and cots, and can be folded so compactly that two persons can carry it easily.

Camping Outfit Consisting of a Tent with a Metal Frame from Which are Suspended Two Cots

DEVICE PREVENTS CARBON TROUBLE IN MOTORS

An automobile attachment which can be put on any engine is designed entirely to prevent the accumulation of



An Automobile Attachment Which by Means of Superheated Steam Prevents the Accumulation of Carbon in the Cylinders

carbon in the cylinders. It consists of two parts: an aluminum container mounted on the exhaust manifold, and a bronze coil wound around the exhaust and leading to the intake manifold. The container is filled with water which the heat of the exhaust causes to boil in about 10 minutes, whereupon the steam is drawn off and sucked through the hot coil, the temperature of which makes it superheated steam. It then passes on and is shot into the mixture in the intake, raising the temperature of the gas as it mingles with it. By weight water has considerably more oxygen than air; the oxygen in the superheated steam combines with the carbon and forms carbon dioxide. Thus any deposit that may exist is burned up in the formation of carbon dioxide. The device also effects a considerable saving of fuel. It will run 200 miles on one filling and is unharmed by running dry.

PRACTICE GOLF BALL THAT SAVES MUCH WALKING

A light, springy golf ball has been produced which is designed especially for a golfer to practice with. The ball responds in direction and accuracy just the same as a regular ball, but it will not go nearly so far and will not damage objects that it may strike. The most furious drive sends it only about 30 yards. The ball is resilient, but its lightness prevents it from carrying long distances. It has an elastic knit covering.

FLOATING CANNERY FOR ALASKAN WATERS

A floating fish cannery has been one of the interesting sights on the Pacific coast this year. A vessel has been fitted out with complete canning equipment and is being sent to Alaskan waters to help gather the wealth of salmon from the northern streams. Several small launches are being taken along to help in hauling in the seines. It is expected that the total harvest of the floating cannery will be close to 50,000 cases of salmon for the short summer season.

A Vessel Fitted Out as a Complete Cannery to Harvest Salmon in Alaskan Waters: The Launches are Taken Along to Help Haul In the Seines

An Excavating Outfit, Operated by a Gasoline Engine, Dredging a Ditch 14 Feet Deep

GASOLINE ENGINE OPERATES EXCAVATING OUTFIT

An excavating outfit for dredging, loading gravel, and making levees is now being used which consists of a scraper attached to a cable whose ends are wound on drums controlled by a gasoline engine. The engine is placed at one side of the ditch or levee, and the cable is stretched to the opposite side, through two pulleys fastened to a frame lying parallel with the ditch, and then back to the engine. By turning the drums the scraper, guided by a workman, can be quickly filled and then carried to the top of the embankment and overturned. The engine is mounted on wheels so that it can be moved along as the work progresses; the framework on the opposite bank is so fastened to a supplementary cable that it can be easily kept opposite the engine.

¶The future of commercial relations between Russia and the United States is very promising. In some quarters it is held that Russia is the greatest single field in the world for new business.

"FIELD PIPE" SMOKED IN TRENCHES IN SAFETY

The "field pipe" is a German invention which smokers at the front can use without fear of attracting the enemy's fire with telltale clouds of smoke or the glow of burning tobacco. The glow in this pipe is entirely concealed, and the smoke is turned into a thin vapor. The article has a rubber bit from which an applewood bowl is suspended by a flexible stem. The bowl resembles a chisel handle; its lower end unscrews and is perforated with several holes. After this cap has been removed the position of the pipe should be reversed for filling; a slide, also perforated, is moved to one side and the tobacco deposited in the bowl. The slide is then

replaced, the bowl allowed to drop down to its normal position, and then it is ready to be lighted, after which the cap is replaced. Between the bowl and the stem is a cup to collect the nicotine and moisture which otherwise would extinguish the fire. The pipe can be smoked with safety in powder magazines.

EROSION OF SEATTLE BLUFF CAUSES MUCH DAMAGE

As an aftermath of a heavy snowstorm which followed a long rainy spell at West Seattle, Wash., early

Scene of the Largest of the Slides: The Two Buildings Shown in the Background Narrowly Escaped being Carried into the Bay Beneath

this year, numerous landslides occurred on a bluff overlooking a bay at one edge of the town. These were caused by the softened condition of the soil, and in some instances did considerable damage. The largest of the slides resulted in the loss of three acres of valuable ground which had been planted in fruit and ornamental trees imported from the Orient. The slip came without a warning, pushing out a large concrete retaining wall and carrying several thousand yards of earth into the water below. Two buildings, a large residence and a garage, were left on the very edge of the gully formed by the slide, the foundation of the latter even being exposed on one side. The crumbling of the cliff on different occasions has caused damage amounting to many thousands of dollars and the loss of four lives.

ACETYLENE GAS GENERATES IN SUNKEN SHIP

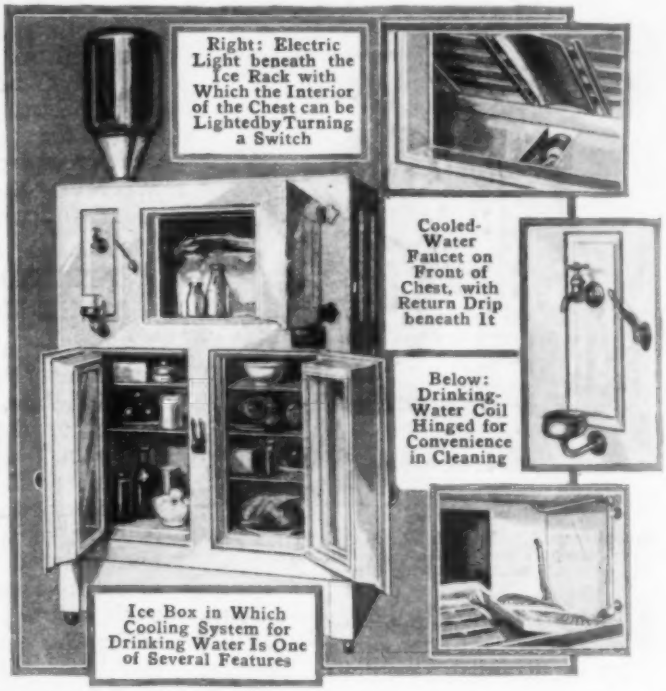
One of the most curious accidents that has befallen an ocean-going vessel in many years took place recently when the "Matatua," a 6,500-ton vessel, caught fire as it was about to sail from St. John, New Brunswick. Unable to check the fire, those in authority decided to open the ship's valves and let it sink by the dock. This put out the blaze but brought on a more serious trouble by generating quantities of acetylene gas. The ship's cargo included 300 tons of calcium carbide that was packed in 240-lb. air-tight tanks and stowed in various portions of seven compartments. After the "Matatua" had sunk, the carbide tanks began to leak, the changing pressure caused by the tide loosening the caps. At St. John the tide rises and falls 30 ft. and when the receding water uncovered some of the containers, they became red-hot and caused an explosion which killed the captain, who had gone on board.

Working at night in this dangerous situation was impractical, and it was considered unsafe to let the vessel's cargo stand partly above water between working hours, lest carbide cans might become heated unobserved and cause an explosion. Accordingly one or two compartments were pumped out and cleared out at a time and then the boat allowed to settle to the bottom until the work was resumed the next day. Tanks that could not be removed immediately were punctured so that they would become flooded with so much water that they would not get overheated. A fan was used to draw off the gas from the compartments in which the laborers worked. Despite all precautions small explosions occurred, but fortunately none of the salvors was injured.

¶A small pearl, still lustrous, whose surroundings indicated that it is between 2,000,000 and 5,000,000 years old, has been found by Stanford University geologists.

ICE BOX HAS SANITARY AND CONVENIENT FEATURES

A particularly sanitary and convenient refrigerator now being manufactured possesses as one of several good features a water-cooling system. A large bottle of drinking water can be set, inverted, in the receptacle above the ice box; its contents passes down through a coil under the cake of ice and thence to a faucet on the front of the refrigerator, below which is a return drip that also serves as a glass holder. The coil has swivel-joint connections so that it can be lifted up when the ice chamber is being cleaned. At small expense each refrigerator may be fitted with a flushing system designed to be connected with the hot-water service pipes. Simply by turning on the hot water the ice chamber, drain, trap, etc., can be flushed thoroughly. Another feature is an electric light concealed under the ice rack and governed by a switch on the front. It lights up the whole interior of the refrigerator and enables one to see the contents without opening the door and raising the temperature of the air within.


Right: Electric Light beneath the Ice Rack with Which the Interior of the Chest can be Lighted by Turning a Switch
Cooled-Water Faucet on Front of Chest, with Return Drip beneath It
Below: Drinking-Water Coil Hinged for Convenience in Cleaning
Ice Box in Which Cooling System for Drinking Water Is One of Several Features

GARBAGE INCINERATORS FOR KITCHEN RANGES

A kitchen stove which is equipped with a small garbage incinerator is being manufactured by an eastern firm of stove makers. The device is inclosed in a chamber situated at the end of the range opposite that occupied by the fire box. In the chamber is a long receptacle with a grate bottom in which the refuse is deposited. Heat from the stove will, in a few hours, dry garbage deposited here; after the moisture has been eliminated in this way a damper may be opened which allows a draft from the fire box to pass over the dried garbage and consume it. These incinerators are attached to coal stoves and combination coal and gas stoves. If preferred, a supplementary gas burner may be installed beneath the garbage container to aid in the drying process and for summer use. Unconsumed portions may be deposited in the fire box or ash pan.

CONVENIENT DELIVERY CAR FOR MOTORCYCLE SHOP

What has been designated as a "motorcycle buckboard" has been constructed by a dealer in Providence,

A Delivery Vehicle with Which One Person can Transport New or Disabled Motorcycles without Towing Them

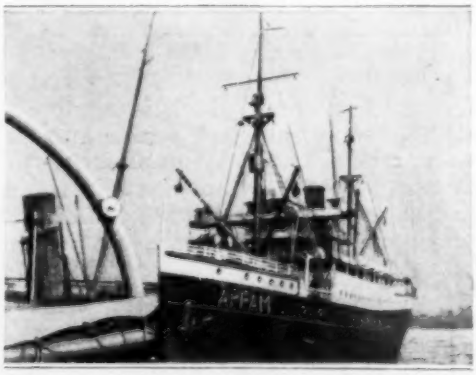
R. I., who wanted a motorcycle with which he could deliver goods and bring in disabled machines. Heretofore he was compelled to send a truck in many such cases. His new delivery vehicle consists of a motorcycle to which is attached a platform, supported by springs and a third wheel the same as a sidecar. At the four corners ropes are attached by which a two-wheeled machine can be tied on in an upright position. The platform is so constructed that sides can be put on quickly, making a substantial body in which bundles can be carried.

SAWMILL WASTE UTILIZED IN MAKING WOOD FLOUR

More than 20,000 tons of wood flour, valued at $300,000, are used annually in the United States in the manufacture of dynamite and in the manufacture of inlaid linoleum. It is also used in making composition flooring, oatmeal paper, and in other products. All of the industries in which wood flour is used require a white or very light cream-colored flour having absorptive powers; spruce, white pine, and poplar are the species of wood most used. Sawmill waste, of which there is said to be a total of 36,000,000 cords each year in this country, furnishes much of the raw material for making this by-product. In the manufacture of inlaid linoleum it is mixed with cementing material. Mills for producing wood flour are scattered from Maine to California, wherever the proper combination of wood and water power is available.

INTERNED GERMAN OFFICERS MAKE MODEL OF "APPAM"

Two officers of the Hamburg-American liner "President Grant," interned at Hoboken, have made a complete model of the now famed prize ship "Appam." The miniature craft is 9 ft. long and was constructed in the short period of three weeks. The hull is built of wood, covered with cloth and painted black, while the superstructure is white. Such things as the anchors and propeller are made of lead, while the portholes are the rims of thimbles. The model is a very faithful reproduction of the English steamer, even the masts, cranes, rigging, and wireless aerials being patterned painstakingly after those of the

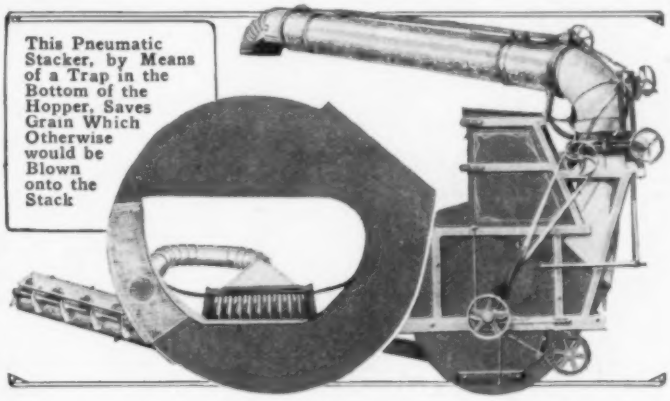


Nine-Foot Model of the Prize Ship "Appam" Which was Made in Three Weeks by Two Interned Sailors at Hoboken

original. The chart room, deck cabins, and lifeboats are all in comparative proportion and properly arranged.

PNEUMATIC STACKER SAVES GRAIN FORMERLY WASTED

A pneumatic grain stacker which materially increases the profits of grain raising by saving the grain which formerly was blown onto the stack with the straw has been used with success on threshing machines of several makes. The feature of this stacker is a trap in the bottom of the hopper, just in front of the entrance to the fan drum. The grain deposited in the hopper with the straw drops to the bottom of the hopper and thence through the trap into a pipe; in the pipe is an auger that carries it back to the tailings auger. In the fan drum is a 4-in. offset to relieve the air compression. From this offset is a 3-in. pipe which leads around under the hopper and discharges air through a wide-spreading nozzle across the trap. This separates the chaff from the grain, sending the former into the fan drum and allowing the grain to be saved.



This Pneumatic Stacker, by Means of a Trap in the Bottom of the Hopper, Saves Grain Which Otherwise would be Blown onto the Stack

TANK CAR SUPPLIES WATER TO RAILROAD ENGINES

During the construction of an electric-transportation line between Montreal and Granby, Que., a rather ingenious water tank was improvised to serve the steam locomotives which were temporarily in use. A spur was made by laying track to the top of a short incline, erected with trestle timbers, at one side of the main line. A tank car was run onto this and its wheels blocked. An old steam shovel, which lacked its crane and dipper, was also pushed onto the spur and connected by pipes with both the tank and a pump that was installed at a near-by brook. In this way water was pumped to the container as needed. A large pipe provided with a manual valve served to convey water from the reservoir. Engines needing water were driven alongside the tank and filled.

Novel Makeshift Water Tank Improvised to Serve Railway Engines Employed during Construction of a Canadian Electric Line

BRICK REFUSE BURNER TOWED ON A SCOW

A difficult and unusual structure-moving feat was successfully carried out on Puget Sound recently when a

Moving a Brick Refuse Burner Weighing 78 Tons on a Scow

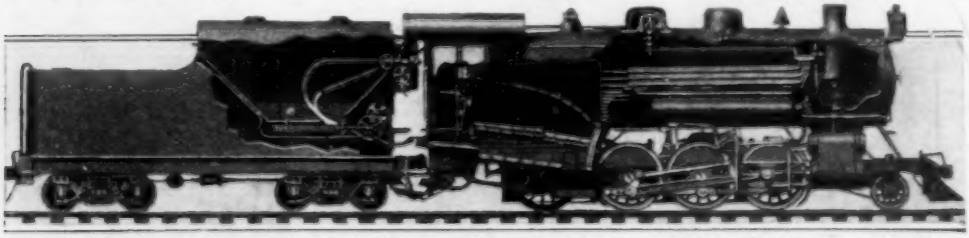
refuse burner made of brick, weighing 78 tons, was placed on a scow and towed a quarter of a mile to a new site. The burner was all that remained of a shingle plant that was burned down five years ago. The cylindrical structure is 13 ft. in diameter and 30 ft. high. A false framework was built under the brick foundations and then it was lowered onto the scow by means of a windlass. It was set without mishap on its new foundations and now is part of a new shingle plant.

PULVERIZED-FUEL BURNING EQUIPMENT FOR ENGINE

In view of the growing attention being paid by railway operators to the plan of employing pulverized fuel in locomotives, the equipment that has been designed for this purpose is of more or less interest. In developing it, attempts have been made to eliminate entirely the necessity of handling coal or ashes manually, and also to so standardize the apparatus as to make its installation in different sizes and types of engines possible. In applying the equipment only a few changes need to be made in existing locomotives, and these are practically confined to simple alterations in the fire box, smoke box, and tender.

The powdered coal is contained in an inclosed tank carried in the tender. It is fed by gravity to conveyor screws which inject it into a compressed-air fuel feeder where it is commingled, carried under pressure to nozzles and blown into fuel-and-air mixers connected directly with the fire box. At this point additional air pressure is provided, and the fuel, now well mixed and in highly combustible form, is drawn into the furnace. Two steam turbines or motors are installed in the tender. One of these operates the screw conveyor, feeder, and commingler. The other is for the pressure blower.

Some of the advantages said to be



The Drawing Shows the Powdered-Fuel Burning Equipment Applied to a Railway Locomotive: The Chief Alterations are Made in the Fire Box, Where Grates, Ash Pans, Fire Doors, and Operating Gear are Removed and a Brick-Lined Fire Pan Installed

gained by utilizing pulverized fuel are economy, greater thermal efficiency, and a material lessening of the smoke, cinder, and noise nuisance. It is claimed to effect a saving of from 15 to 25 per cent in coal of equivalent heat value, and permits the use of exceedingly low-grade fuel. Furthermore it is contended that fire-box temperatures exceeding those given by crude oil are obtainable. Coaling stations and complete plants for drying and pulverizing the fuel are now being constructed by two railroads. Other companies have equipped some locomotives for powdered fuel, but are still relying upon independent sources for the prepared coal.

GERMANS USE LIQUID AIR IN MINING

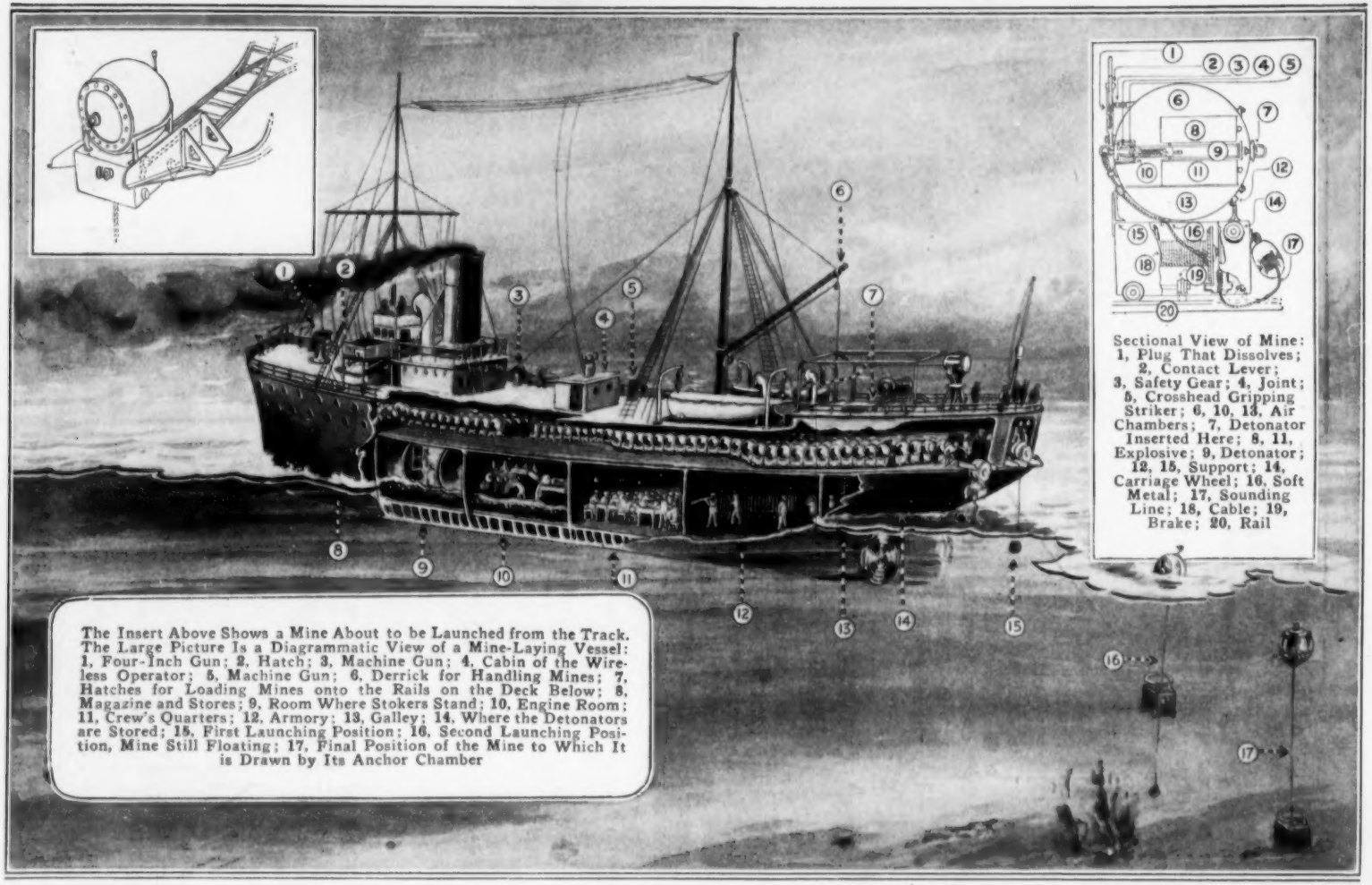
Liquid air has been used increasingly in Germany for blasting, since the outbreak of the war, and so satisfactory has it been found that doubtless it will be used even more after the war. One advantage that liquid air has over other explosives is the safety with which it can be handled. In blasting, black mouselike bags, which are called cartridges, are saturated with the liquid air and used as charges. Though one of the cartridges is more powerful than an ordinary charge of dynamite it can be trampled under foot without any danger, a hissing sound like escaping steam being the only noise produced. The miners take several of these cartridges and with a stick jam them into a hole that has been drilled into the rock. Then when the explosion is about to take place and the rocks are about to be hurled in every direction, the miners hurry to shelter. The charge is set off by means of electricity. According to German figures, the liquid air, under present methods of manufacture, costs about one-half as much as dynamite.

¶ Aeroplanes of various types are now being offered for sale on Broadway, New York. An actress is said to have been the first purchaser.

STORM ENTRANCE FOR SILO ECONOMIZES SILAGE

Economy and convenience are served by a storm entrance which has been constructed by a Missouri farmer at the bottom of his silo chute down which silage is thrown. The chute itself is lighted with two windows so that a worker need not labor in the dark. The storm shelter measures 6 by 7 ft. and has a wide double door; the floor is of concrete. Silage after being thrown on this floor is gathered in baskets for distribution. The shelter prevents the wind from scattering the food, and because of the smooth floor it is possible to gather up all the particles which otherwise might be lost.

A Silo with a Storm Entrance Built to Economize Silage, and for Convenience



The Insert Above Shows a Mine About to be Launched from the Track. The Large Picture Is a Diagrammatic View of a Mine-Laying Vessel: 1, Four-Inch Gun; 2, Hatch; 3, Machine Gun; 4, Cabin of the Wireless Operator; 5, Machine Gun; 6, Derrick for Handling Mines; 7, Hatches for Loading Mines onto the Rails on the Deck Below; 8, Magazine and Stores; 9, Room Where Stokers Stand; 10, Engine Room; 11, Crew's Quarters; 12, Armory; 13, Galley; 14, Where the Detonators are Stored; 15, First Launching Position; 16, Second Launching Position, Mine Still Floating; 17, Final Position of the Mine to Which It is Drawn by Its Anchor Chamber

Sectional View of Mine: 1, Plug That Dissolves; 2, Contact Lever; 3, Safety Gear; 4, Joint; 5, Crosshead Gripping Striker; 6, 10, 13, Air Chambers; 7, Detonator Inserted Here; 8, 11, Explosive; 9, Detonator; 12, 15, Support; 14, Carriage Wheel; 16, Soft Metal; 17, Sounding Line; 18, Cable; 19, Brake; 20, Rail

HOW MINES ARE LAID AND FIRED

One of the ways in which the belligerent nations lay mines in harbors and other waters is to use a vessel, on one deck of which are several narrow tracks supporting the mines, each of which is mounted on wheels. Each mine is in turn rolled to the stern and, by means of special launching tracks, is dropped into the sea without tilting. A mine of the character described is made up of three parts: A spherical floating chamber containing the explosive, etc.; an anchor chamber which is connected with the former by a cable, and a weighted sounding line. The length of the latter is equal to the depth at which the mine is to float. When in the water the line drops rapidly; the anchor chamber lowers more slowly, and the sphere floats on the surface temporarily. When the end of the sounding line strikes bottom the lessening of its pull throws a pawl which prevents the drum in the anchor chamber from paying out more cable to the sphere. Consequently the latter is drawn under water to a depth equal to the length of the sounding line, as the anchor chamber settles to the bottom. When a ship strikes this sphere it causes it to spin rapidly, thereby deflecting radially a contact lever extending from its under side. This allows the cable to pull out a crosshead which in turn releases a firing pin, causing an explosion.

NEW PORTABLE TELEPHONE FOR FOREST RANGERS

In the future the government's forest rangers will be equipped with an exceedingly light and compact telephone designed particularly to meet their needs. It is of a new type, recently invented by a Montana forest officer, and is regarded as a distinct improvement over the 10-lb. apparatus in present use. The instrument is constructed largely of aluminum, and weighs complete only 2½ lb. In appearance it is similar to instruments used extensively in France, and to some extent with intercommunicating systems here. It is an assemblage of standard pieces of equipment mounted in a new way and combining an old method of signaling.

The New Portable Telephone for Forest Rangers: By Looping a Wire over a Line Above, and Grounding Another, a Connection is Made with Headquarters, as shown at the Left

The transmitter and receiver are mounted on the same side, but at opposite ends, of an aluminum tube which contains a battery of three dry cells. Their relative position is such that when one places the receiver to the ear the transmitter is brought within a few inches of the mouth. The induction coil, a switch, and the wiring are contained within an aluminum case attached to the battery tube and occupying the space between the ear and mouthpieces. Two push buttons are provided on one side of this housing. One is used for signaling purposes and the other employed when a person is talking. Signals are sent by means of a high-frequency current and received by a high-wound, audible receiver, consisting of an adjustable diaphragm and megaphone which emits a screeching noise that can be heard at some distance. A connection is made with a telephone line, and one wire grounded, when the instrument is to be used. For this purpose a portable grounding rod, about two feet in length, is carried. In field tests, signals have been sent 88 miles without trouble, while conversations have been held with the set at

distances of 1,000 miles. In laboratory tests satisfactory signals have been sent over a line equivalent in resistance to 180 miles of No. 9 iron wire. Owing to its lightness, it will be possible for all fire guards and forest officers to carry the instrument. In the past it has frequently been impossible for the men to carry telephone equipment with them because of its excessive weight.

WAR MUNITIONS ARE MADE FROM STEEL RAILS

Three thousand tons of worn-out steel rails recently constituted the cargo of a homeward-bound Italian steamer when it left its berth in the Delaware River. The old rails were no longer fit for service and had been scrapped by one of the eastern transportation companies. Owing to the shortage of iron and steel abroad, they were purchased by agents representing the Italian government and will be melted down for use in the manufacture of munitions of war. To facilitate loading, the rails were cut in two on the dock with the aid of oxyacetylene torches.

The Old Rails were Cut in Two with Oxyacetylene Torches in Order to Facilitate the Work of Loading Them into the Steamer

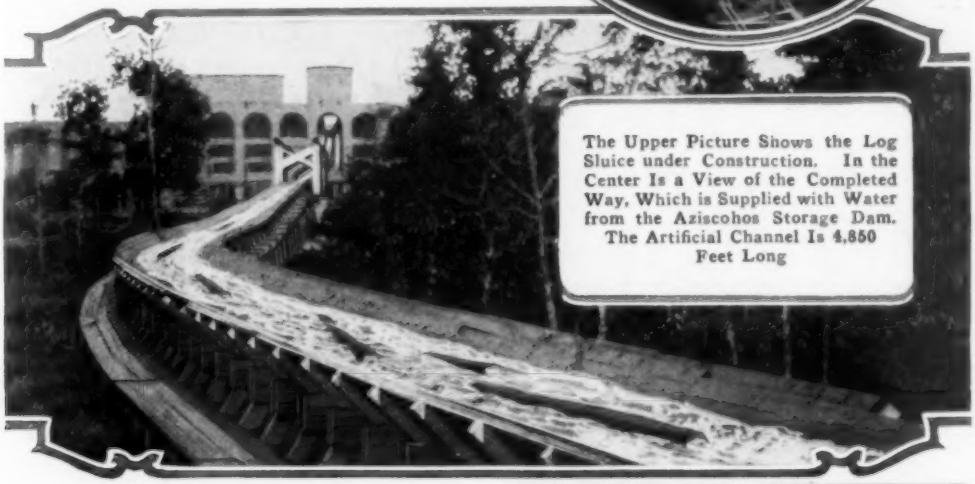
¶The city of Ashland, Ore., is supplying its citizens with free electric current for their porch lights.

CANAL ACROSS WATERSHED WOULD PREVENT FLOODS

As a means of preventing floods, such as have repeatedly devastated the Scioto, Sandusky, and Olentangy river valleys in Ohio, a professor of civil engineering in that state has proposed that a canal be cut through the divide which, roughly speaking, runs east and west through the central part of the state. This would permit the waters of the upper Scioto and Olentangy, which now flow southward into the Ohio River, to empty into Lake Erie. These two streams run almost parallel and not a great distance apart, and their upper waters would be diverted by the proposed canal into the Sandusky River, which flows northward into Lake Erie. As proof that this would not be a difficult engineering task, it is pointed out that in the floods of 1913 the waters of the upper Scioto actually did escape over the peak of the watershed and flowed into Lake Erie. It is proposed to control these rivers further by erecting great reservoirs. The professor, who has studied the project, believes that these changes would lead to the complete canalization of the Scioto and Sandusky rivers so that freight could be brought along this route from Lake Erie to the Ohio River. The complete protection of the three river valleys by canals and reservoirs would cost approximately $17,000,000, according to estimates.

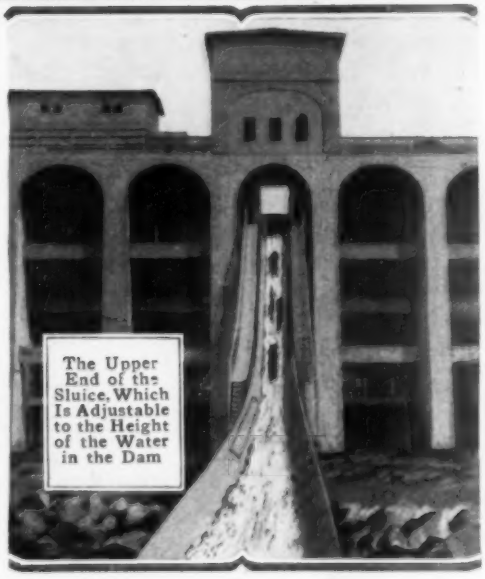
LOG SLUICE ON MAGALLOWAY RIVER IN MAINE

In building the Aziscohos storage dam across the Magalloway River in Maine recently, it was necessary to make artificial provisions for log driving, since the reservoir was to retain practically all of the flow that formerly had been used for this purpose. Therefore a log sluice, 4,850 ft. in length, was constructed. This is now in use and is proving to be much more economical and efficient for the lumber interests, and every one else concerned, than the old method, which used up all of the water in the springtime and left none for operating the mills below after the logs had been delivered to them.



The Upper Picture Shows the Log Sluice under Construction. In the Center Is a View of the Completed Way, Which is Supplied with Water from the Aziscohos Storage Dam. The Artificial Channel Is 4,850 Feet Long

The sluiceway is a V-shaped trough, about a foot wide at the bottom, from six to seven feet wide at the top, and having a depth of from three to four feet. The upper end is supported on a steel truss, 97 ft. in height, and arranged so that it may be raised or lowered in accordance with the status of the water back of the dam. The chute itself is made of 2-in. planking, lined with 1¼-in. boards and carried on a framework that holds it several feet above the ground. With the exception of the slide at the dam, the grade of the sluice varies from a drop of about two feet in 100 to approximately six



The Upper End of the Sluice, Which Is Adjustable to the Height of the Water in the Dam

feet in the same distance. The curves are very gradual, so that the chance of jamming is largely eliminated.

A crew of about a dozen men stationed at the head of the sluice, which is at the middle part of the dam, poles the logs into it. Usually these go down in single file and make the trip to a lake at the other end in exactly three minutes. It is interesting that this is about a half minute quicker than the water travels the distance, and that when logs were driven down the river in the past they consumed about 22 minutes in reaching the same point.

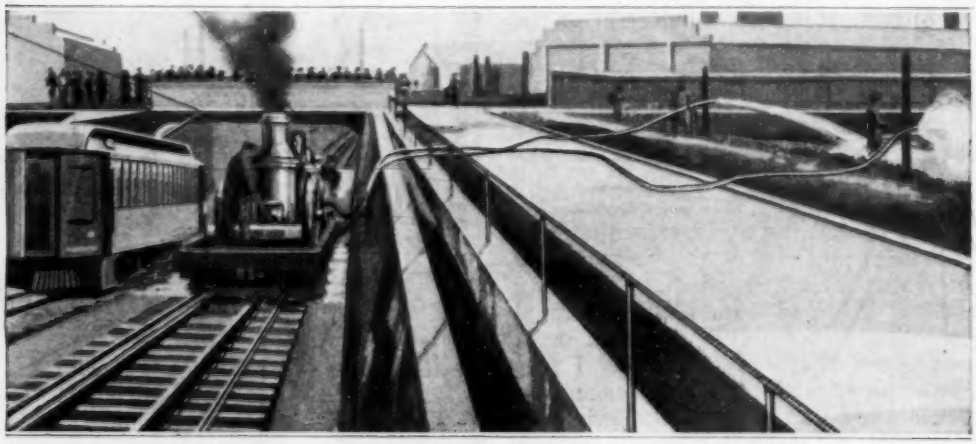
Where it used to require from 1,200 to 2,800 cu. ft. of water to drive the logs over this stretch, the sluice uses less than 100 cu. ft. in doing the same volume of work. Likewise the number of men required in handling the logs has been materially lessened, while the cost of the work has been cut to about a sixth.

FIRE ENGINE PUMPS WATER FROM RAILROAD SUBWAY

The torrential rainfall which accompanied a very violent storm that recently swept over California caused considerable delay in traffic between San Francisco and its trans-bay suburbs which was only relieved by the ingenious use of a fire engine. The transportation service for Berkeley, Oakland, and other suburbs, includes electric lines which lead to a pier whence passengers are ferried to San Francisco. At one point these lines pass beneath a railroad by way of a subway, 100 ft. long and having approaches each approximately 500 ft. long. The rain fell so heavily that the pumps installed in the subway were unable to remove the water that flowed down the approaches and accumulated to a depth of nearly 10 ft. The Oakland fire department was finally called on and furnished a fire engine which was mounted on a flat car and backed down one of the approaches, whence it pumped out the water. Train service was resumed after 12 hours' delay.

ODD-APPEARING MOTOR CAR IS ANCHOR FOR BALLOON

On the western battle front the French signal corps is employing a special motor truck of peculiar design as a part of its equipment for operating a captive balloon. The car is so built that it has the appearance of possessing two separate bodies, one placed at right angles to and at the rear of the other. In the middle of the chassis there is a windlass upon which the cable, holding the balloon, is wound. This is driven by an auxiliary motor mounted at the back of the machine. At the rear of



Two Streams being Pumped from the Flooded Subway by a Fire Engine

The Officer at the Right is Receiving a Message Sent Down from an Observer Stationed in a Captive Balloon above the Battle Field

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the hood covering this, a seat is provided for the operator of the reel. The car serves as an anchorage for the balloon and also as the receiving station for the observer's messages. A trolley holding a cylindrical tube in which notes are carried, operates on the cable and is sent down whenever the observer wishes to make a report.

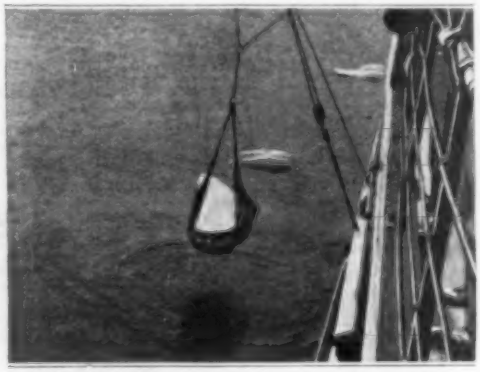
DEVICE FOR JUDGING SMOKE DENSITY

A device has been made for judging smoke density consisting of a tube having a single eyepiece at one end and two openings at the other. One of these openings is clear and the other is covered by a portion of a rotating diaphragm containing five disks, one clear and the others shaded according to the various tints to be found on a "smoke chart" by which densities of smoke are judged. By looking through the instrument and turning the diaphragm until it presents a surface having the same shade of smokiness as that presented through the clear opening, one secures an accurate measure of the smoke density of the atmosphere.

¶Experiments by English chemists who are seeking to overcome the present shortage of potash show that a ton of banana stalks will yield about 25 lb. of pure potash.

SHIPS SECURE FRESH ICE FROM THE SEA

Tourists aboard vessels in Alaskan waters are often entertained by seeing a ship's crew fill the vessel's ice boxes with fresh ice taken from the salt water. Heavy nets are let down into the sea and fastened about floating cakes of ice, which are then easily lifted aboard by means of a crane. The material secured for the refrigerators in this way is from glaciers which extend down into the ocean. These glaciers are continually discharging great masses of ice into the water, which finally find their way out to the channels followed by the ships. In ten minutes three or four tons can be brought on board if the floating fragments are plentiful.



An Alaskan Vessel Filling Its Refrigerating Boxes with Glacier Ice

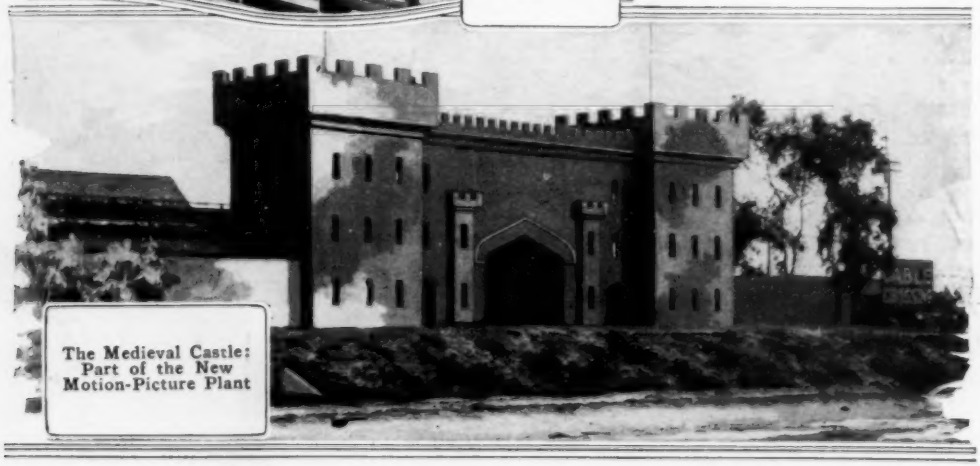
MOTION-PICTURE PLANT HAS VARIED SCENERY

A motion-picture company has recently completed a producing plant at Coronado, Cal., which, with its immediate environs, offers a large variety of scenery both natural and artificial. The establishment occupies a city block; its buildings face upon a central open-air court where there is a stage. Above the stage are numerous curtains employed in properly lighting the settings below. One of the buildings represents a medieval castle. On the bay still-water scenes are enacted; surf scenery is found about a mile distant.

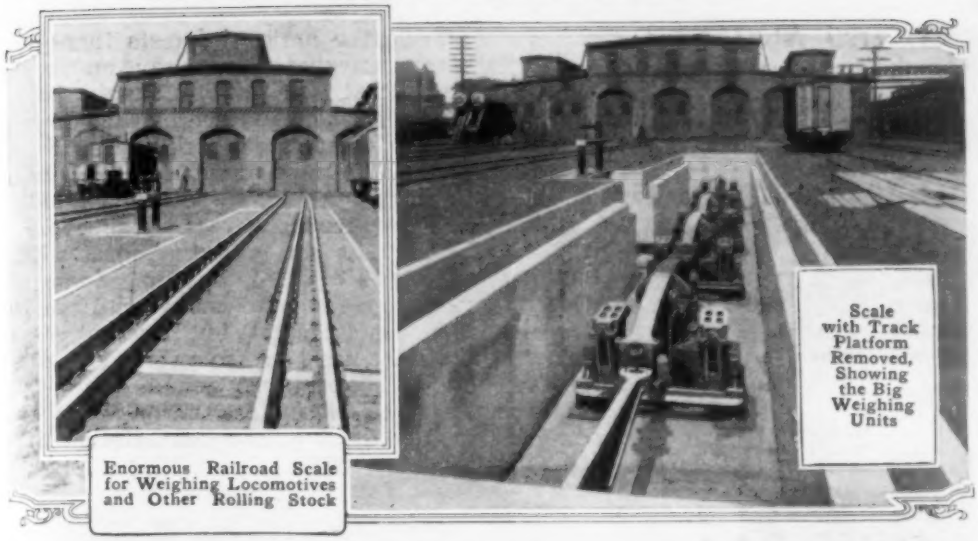
The Open-Air Stage of the New Motion-Picture Plant at Coronado, California

TO IMPROVE COAST-GUARD SIGNAL SYSTEM

Guardsmen of the coast-guard service are now being instructed in a new system of torchlight signaling by which communication may be established with outlying ships, especially those not fitted with wireless equipment. At the present time the service relies solely on the use of colored warning lights fired by patrolmen, and has no means of communicating by signal with the vessels off shore. Under the new method it is expected that any ship may run within two or three miles of the coast and exchange messages with the patrolmen. Each of the coast-guard buildings maintains a lookout in its tower day and night, and these towers are to be supplied with Morse blinker lights which will enable them to signal messages at greater distances than with a patrolman's hand torch. It is believed that the blinker lights and the new hand-torch signal system will be great aids in making it possible for ships to communicate with the Atlantic coast at all times, even without wireless.



The Medieval Castle: Part of the New Motion-Picture Plant



Enormous Railroad Scale for Weighing Locomotives and Other Rolling Stock

ENORMOUS LOADS WEIGHED BY TRACK SCALE

At West Albany, N. Y., one of the eastern railroad companies has installed a track scale which is theoretically capable of accommodating a 1,650,000-lb. load. It is 100 ft. in length and is an assemblage of six weighing instruments, each designed to have a capacity of 275,000 lb. The load applied to each section is transmitted to an additional lever and through it to a weighing beam housed at one side. The scale is one of the largest of its kind ever built and is employed in weighing locomotives and other rolling stock. Engines of the Pacific type weigh about 215 tons, but it would take four of these piled on top of each other to overload the scale. The reason for designing the mechanism for such a great capacity was partly to insure its permanent adequacy. Tests have been made which show that the variation between the different sections is less than 10 pounds.

¶So highly inflammable are some of the glittering trimmings now used on women's dresses, that the New York fire department has suggested that they be condemned. Fireproofing of the materials is possible and has been recommended.

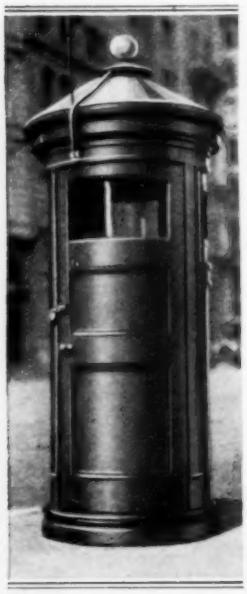
SMALL DRILL EMPLOYED AS AID TO STEAM SHOVEL

An economical method of breaking up large rocks so that they can be handled by a steam shovel is to employ a light hand-drilling machine to make holes in the large pieces in which dynamite or powder can be exploded. Such drills are operated from an air pump mounted on the shovel, or by steam from the shovel boiler. The old method was to lay a large charge on a rock, cover it over with mud, and light the fuse. The downward explosive force would shatter the bowlder, but a larger amount of explosive was needed than by the present method, which saves enough powder or dynamite to more than offset the cost of the drill and the drilling.

Small Drill Breaks Up Rocks for Steam Shovel

OFFICERS ALWAYS ON DUTY IN NEW POLICE BOOTHS

Police booths are being installed by the city of New York, at the intersections of the streets and avenues, in which officers will be constantly on duty. The booths are circular in form, about 10 ft. high and 4 ft in diameter; they are made of wood covered with sheet iron. Each booth is connected directly with a police station and is equipped with a telephone, etc. Green lights show from the windows and from the top so that at night a booth can be easily located. In the outlying districts the police shelters are larger and of more permanent character. It is said that the system of having officers stationed so that they can be found instantly in any emergency is already proving a success.



NATIONAL FORESTS YIELD MUCH CASCARA BARK

The fact that 36,000 lb. of cascara bark were cut in the Siuslaw National Forest in Oregon during the latter half of last year indicates that there is a growing demand for this product, which possesses medicinal properties. The tree from which this bark is stripped is variously known as cascara, chittim, and bearberry; the latter name is derived from the fact that bears are very fond of the berrylike fruit and often climb the trees to obtain it, badly mutilating the bark of many trees which consequently have been unmolested by the bark hunters. At the present time, outside the national forests there are comparatively few trees, save mutilated ones, that are left to supply bark. Under rules maintained by the government's foresters the bark gatherers are required to leave stumps 6 in. high with bark undisturbed; these sprout rapidly and produce new trees. The peeling season lasts from April to August, when the tree's coat tightens up. Some 15 years ago the bark was worth from 10 to 20 cents a pound, but in recent years the price has been from three and one-half to six cents per pound. The bark is peeled off in long strips and thoroughly dried in the sun before being taken to market.

CHERRY-PITTING MACHINE OF SIMPLE DESIGN

Durability and simplicity of construction characterize a cherry-pitting machine which has been patented by a man in Nebraska. It consists of a semicylindrical hopper fastened to an upright framework by springs. Lengthwise in the bottom of the hopper extend a series of depressions which receive a corresponding number of cherries. By means of handles at either end of the hopper it may be lowered on its framework; this movement automatically thrusts plungers through the cherries retained in the depressions which remain fixed and do not move with the hopper. When the pressure is removed from the latter the springs raise it and the plungers to their normal position. At the same time the pitted fruit is removed from the end of the plunger and deposited in a holder, which in turn deposits it in a dish.

RAILROAD IN ALASKA PRESENTS MANY PROBLEMS

The Great Wooden Railway Trestle Which the Construction of a Tunnel will Eliminate
Scenery along the Southern Portion of the Government Railway's Route
Dog Teams Hauling Lumber Supplies Overland for the Government's Transportation Line in Alaska

Hauling Supplies over the Railway Extending Northward from Seward

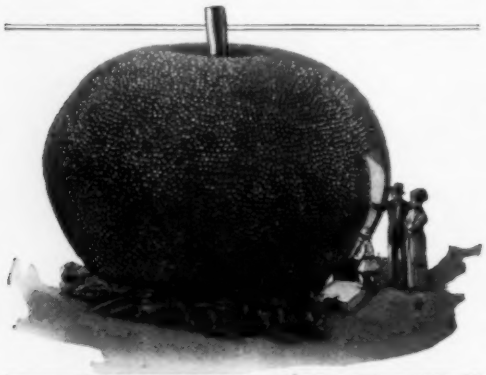
Many problems, most of them radically different from those which confronted the government's engineers in the Panama Canal Zone, are now being grappled with by the men to whom has been assigned the task of constructing the government railroad in Alaska. This undertaking, which Congress specified in its authorization should not cost more than $35,000,000 and which will be built to tap undeveloped regions of the territory, has already been described, as to route, in Popular Mechanics Magazine.

One of the first problems encountered in this northern land by surveyors and engineers has been the hordes of mosquitoes. The insects have been so numerous in places that it has been necessary to wear head nets and gloves. The government has purchased the privately built railway which runs some 70 miles northward from Seward, and will alter it somewhat and make it a part of the general system of which Fairbanks will be one of the principal interior points. A feature of the purchased line, which the government engineers will eliminate by the construction of a single tunnel, is a huge wooden trestle 120 ft. high and 1,200 ft. long, made of approximately a million timbers. The transportation of supplies is accomplished with difficulty along portions of the proposed route of the railway. Dogs are employed to haul food, equipment, and even lum-

ber; not only do they pull sleds, but they are sometimes hitched to handcars and made to pull them along the railway tracks.

ENORMOUS "APPLE" IS BOOTH AT STATE FRUIT SHOW

By far the most striking booth erected at the Indiana Apple Show, held some time ago at Indianapolis,

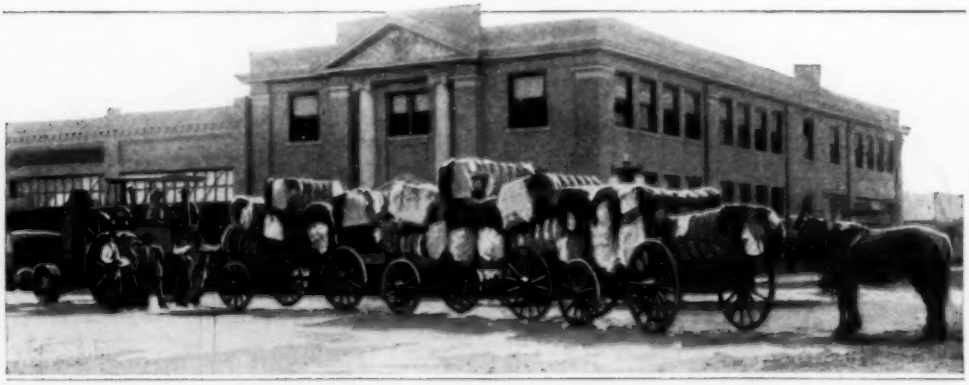


The Large Room Provided Inside of This "Apple" was Used by Representatives of an Agricultural College during a State Fruit Show

was that of the College of Agriculture of Purdue University. It consisted of a large apple-shaped house which was solidly covered with thousands of big red apples. The booth was used by the representatives of the institution who met persons interested in horticultural subjects. It was constructed of wood, and the fruit was nailed to the outer surface so closely that hardly any of the framework was visible. In one side a doorway was cut and steps extended up to the level of the flooring inside. At the top there was a realistic-looking stem, while banked around the bottom was a profusion of greenery. Obviously the booth attracted much comment, but it also served to impress its observers with the importance of Indiana as an apple-growing state.

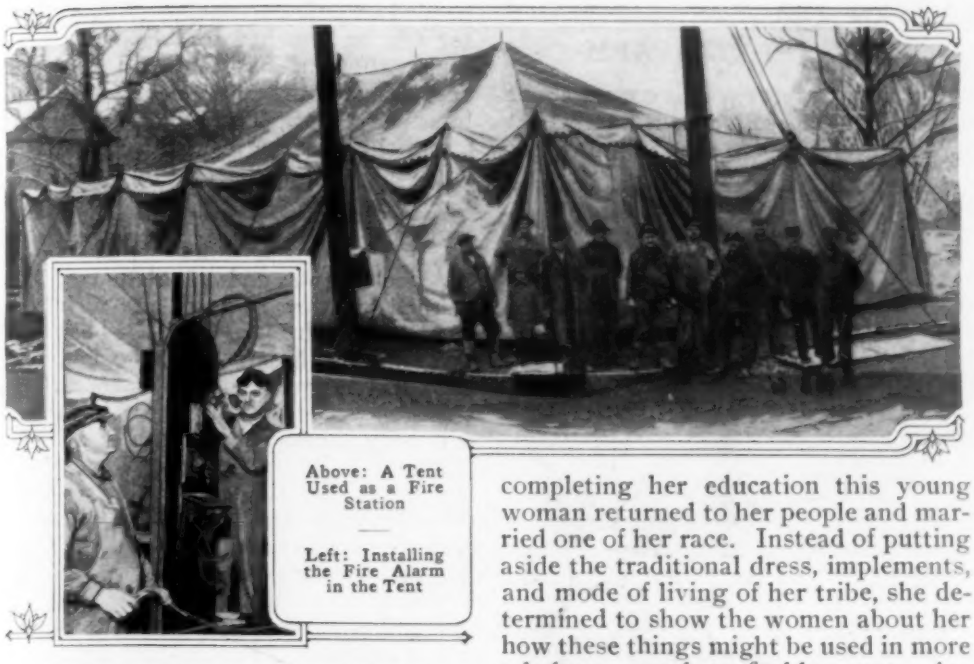
MOUNTING FOR PROTECTING THERMOELEMENTS

In connection with an investigation of the expansion of substances on heating, the Bureau of Standards has developed a mounting for protecting laboratory thermoelements from damage by mechanical strain or otherwise. Protective mountings with convenient heads for attaching the leads to millivoltmeters are common with industrial thermocouples, but in a chemical or physical laboratory the wires of the average couple are either entirely unprotected or only have glass or porcelain tubes at the junctions. The mounting now used in the Bureau of Standards not only gives ample protection to the thermoelement, but makes it more convenient to use.



TRACTOR HAULS COTTON CROP TO MARKET

AN example of the modern efficient methods characteristic of an increasing number of plantations: Much of the work of raising this cotton, which is from western Texas, was done with the aid of this same gasoline tractor.



Above: A Tent Used as a Fire Station

Left: Installing the Fire Alarm in the Tent

FIRE COMPANY HOUSED IN A TENT

A large tent, which looks as though it might be the home of a circus, is in reality the home of one of Cincinnati's fire companies. Pending the erection of a new fire house this temporary shelter was provided by the city so that the district in which it is located might not be without adequate fire protection. In the daytime the firemen make the tent their headquarters, and at night those not on duty sleep in the house adjoining the tent. The fire alarm has been installed in the tent, and extensions of both the alarm and the telephone have been installed close to the cots of the firemen. The men are able to respond to calls almost as quickly as if they had the regular equipment.

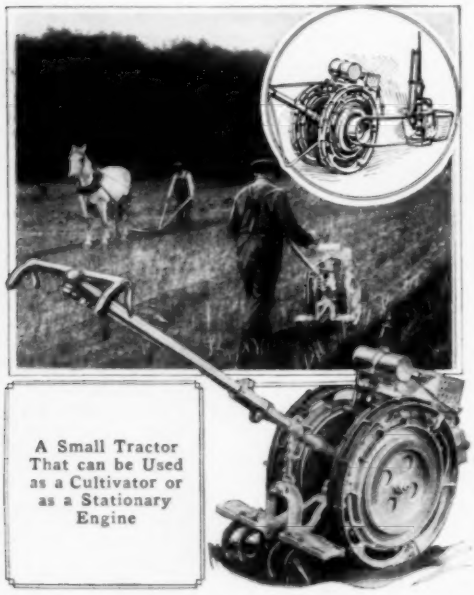
PRIMITIVE LIFE ELEVATED BY EDUCATED INDIAN

A remarkable example of the spirit which higher education may infuse into primitive peoples is found in the life of a Pueblo Indian woman who is a graduate of the Carlisle Indian School. On completing her education this young woman returned to her people and married one of her race. Instead of putting aside the traditional dress, implements, and mode of living of her tribe, she determined to show the women about her how these things might be used in more wholesome and profitable ways. Accordingly she lives in strictly Indian style, wearing the Indian dress and performing her household duties with Indian utensils, but in all that she does she shows the effect of her education, for she is scrupulously clean, very systematic, and painstaking. She seeks to elevate Indian life. It is this ideal which she is teaching her fellow women, thereby illustrating in a special way the spirit of the school which gave her an education.

An Educated Indian Woman, Who is Seeking to Elevate the Customs of Her People Rather than Abandon Them

GARDEN TRACTOR HAS MANY USES ON THE FARM

A garden tractor which covers about twice as much ground as a handwheel cultivator and can be used in numerous ways as a stationary engine, has recently been placed on the market by a Minneapolis company. The machine has two power wheels and is guided by handles like a cultivator; to the handles are attached the finger latches by which the engine is governed. Back of the two main wheels are two caster wheels which can be adjusted to regulate the depth of the hoes or knives accurately. The machine is so made that it can be fitted with cultivating attachments of various makes and varieties, and can be set to suit rows of various widths. The tractor is 25 in. high, 17 in. wide, and there is a space of 10 in. between the wheels; it weighs 449 lb. Operating a belt as, for example, for a cream separator, fanning mill, pump, etc., it develops 4 hp. and, on a drawbar, 2 hp. Its speed is from one to three miles per hour. By removing the wheels, etc., the engine can be mounted on a binder and made to operate it so that only two horses are needed to pull the machine. The tractor can be attached to a lawn mower. One gallon of gasoline will run the engine five hours in the field, and seven hours on a belt. Truck gardeners have found the machine especially useful.



A Small Tractor That can be Used as a Cultivator or as a Stationary Engine

SIMPLE TELEGRAPH CODE THAT ANYONE CAN USE

A telegraph code which can be learned in a few minutes and which is composed entirely of dots has been devised by a railroad man who believes that it has great possibilities as an emergency code. To learn the system it is only necessary to write down the alphabet in its usual order, placing six letters to a line; A to F, inclusive, will constitute the first line; G to L, inclusive, the second line, and so on; the fifth line will be composed of Y and Z only. The dots for each letter are ascertained by numbering each with two numerals: first a numeral indicating the group to which the letter belongs and second its position in that group. Thus A is 1/1; B is 1/2; C is 1/3, and so on, to F, 1/6. The second group is numbered similarly from one to six except that the number indicating the group is "two" instead of "one"; Z, which is the second letter in the fifth group, is 5/2. After a person has written out the alphabet in this manner and set it before him, he can with very little practice spell out any message he may desire to send. The procedure is first to strike the number of dots indicating the letter's group and then after a pause strike the number of dots indicating the letter's position in that group. Amateur wireless operators, boy scouts, miners in distress, mariners, ignorant of the Morse code but familiar with the simple principle employed in this one—for all of these the code offers interesting possibilities. The 10 digits are expressed by dots corresponding to their value, naught being indicated by 3/3. A person about to use this code should first signal 2/6 several times, meaning that he is going to use the 26 letters of the alphabet according to the scheme described.

Teaching Children to Swim

by F. J. Brunner
Coach-Washington Swimming Club

Part I - Teaching the Strokes on Land

SWIMMING, more than any other single branch of athletics, is peculiarly suited for all-round development. No other form of exercise is so safe, for, on account of the give to the water, there is no danger from broken bones, black eyes, sprain, or rupture. When properly taught, it is of great value in developing both sides of the body and is equally valuable in teaching muscular control and concentration of mind. Indeed many minor deformities are often corrected.

A child* eight or nine years of age, who can take a front header into the water, going down two or three feet, and, upon coming up, swim a hundred yards, with the ability to turn on the back to cough when necessary, has a confidence in himself obtainable in no other way. He has a knowledge, too, that can save his life and be useful as a means of exercise even in his old age.

The proper time to start teaching a child is when his tub baths begin; say, at two or three months of age. It is astonishing how quickly he will learn. Take care not to frighten him, but have everything done in a playful spirit, with much laughter and fun. Allowing a small stream of water to trickle from a squeezed towel over his head and body, splashing in front and back, and splashing with the child's own hands and feet are the simple ways. Never, under any circumstances, force the child to do anything against his inclination; too short a time in the tub is better than too long a time.

To add to the enjoyment of the "swim," the baby should be taught to splash with his hands while sitting in the water. He will also enjoy splashing with his feet, and can easily be shown how to use both hands and feet at the same time.

After his first year he may endeavor to put his face in the water of his own accord, if he has seen some one else do it. He can get on his hands and knees, or lie down on his chest with his arms stretched out in front. In the latter position, teach him to splash with both the feet and hands. Some children will even put the face under while splashing both sets of limbs.

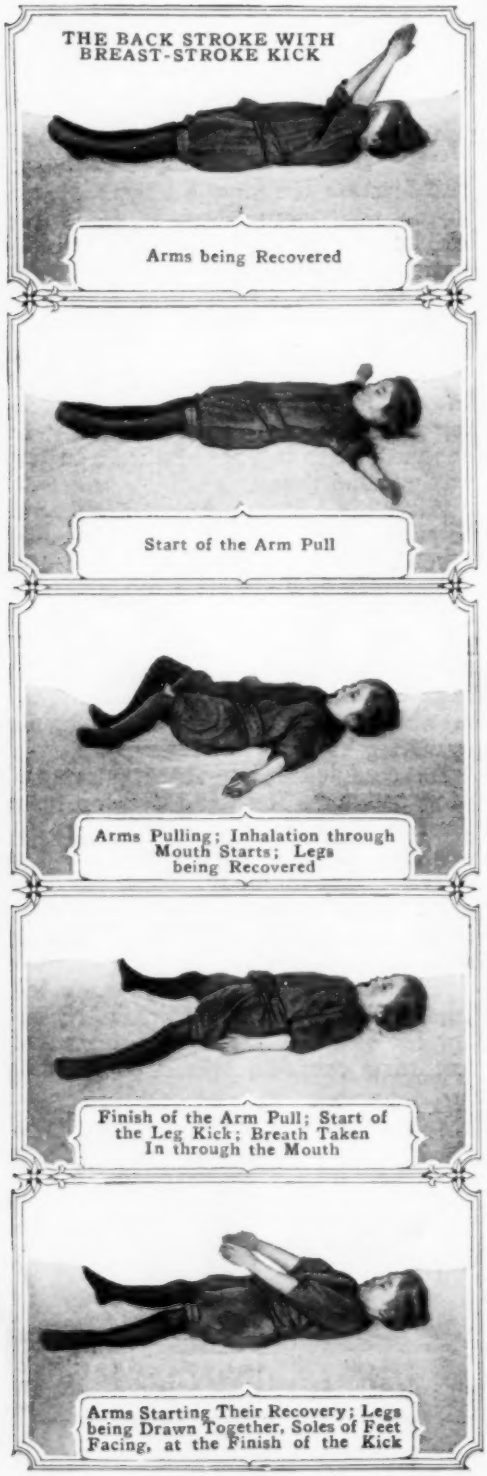
As confidence is gained, start the "dog paddle." It should develop from the splashing of the arms while on the knees. The first step is to pull the water toward the body. Next have the pupil lie flat and do the same thing. Progress will be very slow and the attempts necessarily crude.

A source of much amusement is blowing bubbles with the mouth slightly below the surface. From this, teach the breathing exercise, which consists of

Breathing Exercises: "Slowly forcing air out of the lungs while the mouth is under—

and raising the head for a quick intake. The head should be twisted to one side on bringing it up."

* While this article deals with the teaching of children, most of the methods described, especially the land exercises, can be used for adults as well.


THE BACK STROKE WITH BREAST-STROKE KICK
Arms being Recovered
Start of the Arm Pull
Arms Pulling; Inhalation through Mouth Starts; Legs being Recovered
Finish of the Arm Pull; Start of the Leg Kick; Breath Taken In through the Mouth
Arms Starting Their Recovery; Legs being Drawn Together, Soles of Feet Facing, at the Finish of the Kick

slowly forcing the air out of the lungs while the mouth is under, and raising the head for a quick intake. As experience is gained, the head should be twisted to one side on bringing it up. The intake will be easy enough, provided the lungs are empty. To encourage exhalation, command, "Blow out." This breathing exercise can also be practiced in a basin placed on a support at such a height that the face can be put in by bending at the waist.

The proper way to breathe in swimming is to exhale through the nose, and inhale through the mouth, making respiration continuous and taking about three times as long to exhale as to inhale; but for very young children it will not be possible to teach this nose exhaling at all, because it will be confusing. Indeed, in instructing grown-ups, it is usually necessary to have them, in the beginning, use the mouth alone.

It is but a question of a short time when the child will voluntarily get on his back and splash vigorously with both feet and hands. The water can be made deeper from day to day, and a supporting hand should then be placed under his head to guard against a sudden turning. At first, teach a simple up and down movement of the hands; then, as he grows older and more familiar with the water, this can be changed to an attempt at the sculling movement, shoving the water away from the hips and pulling it back again, using the palms of the hands as paddles.

The easiest and most restful position in the water is on the back. So a swimmer, when in trouble from water in his windpipe, should always turn on his back to cough. Therefore, from the very start of his swimming career, it should be drilled into the child to turn on his back the moment he has to cough. For practice, have him play at coughing, and at the start guide the head.

As the splashing of the hands develops into the sculling movement, so the splashing of the feet can be developed into the straight-leg kick. See that the knees are not bent.

After baby learns to walk, teach him

to "dive" from a table or other height that is on a level with the parent's waist. In reality this dive is simply a falling forward while the parent shoots his hands under the diver's armpits before the little feet leave their support. Swinging the arms and taking breaths through the mouth before falling will be readily learned, and by the time the second or third year is reached, he may be able to actually jump through space.

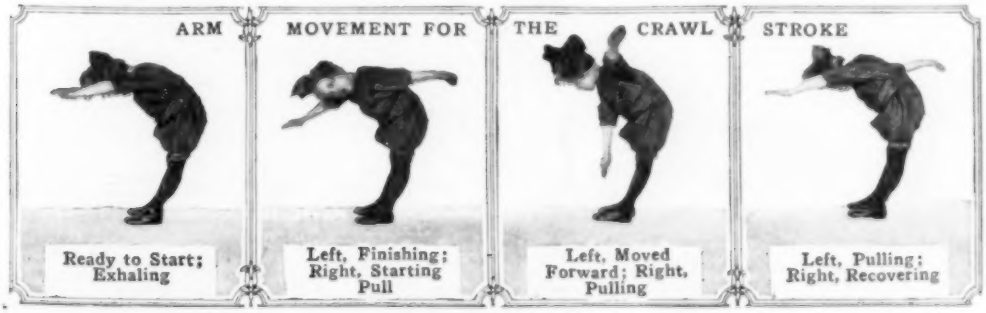
ALTERNATE OVER-ARM STROKE ON THE BACK
Left Arm Pulling; Right Leg Kicking; Right Arm Recovering
Left Arm Finishing Pull; Inhalation through the Mouth; Right Arm About to Start Its Pull

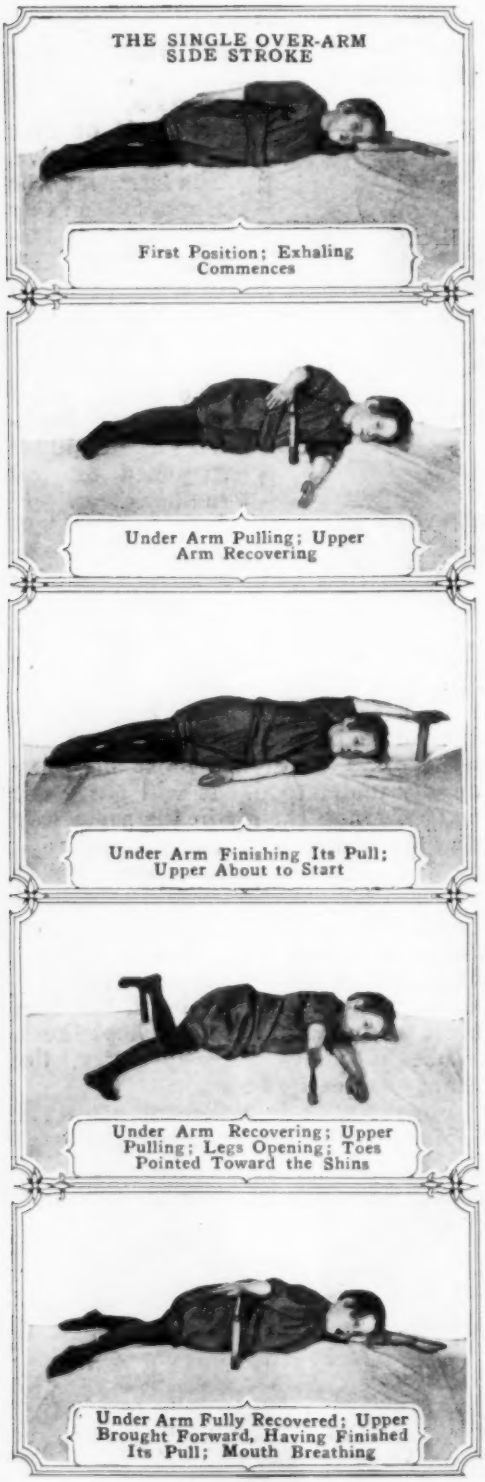
About the time the jumping lessons begin, diving on a soft bed can also start. Of course, there must be a springboard, and one made of a folded comfort will do nicely. Have him get a good firm grip on the end of the "board" with his toes, inhale through his mouth, hold his breath, swing his arms once, as in the standing broad jump, and fall forward. The face is buried in a soft pillow placed where the head and chest will hit. As he grows older and more experienced, raise the "springboard," and the ability to spring forward will probably be acquired. To encourage it, erect a bumper of several soft pillows at the end of the bed for the head to sink into.

Two other dives can now be taught. The "president's seat," which is simply a jump and an alighting in a sitting position, and the first half of the "comeback" dive. The latter is to be attempted after the first is mastered. It consists in starting as in the president's seat and, while in the air, throwing the arms and shoulders backward, alighting stretched out on the back.

There is no danger at all in the moderate practice of the front dive, the president's seat, and the comeback on the bed, but, if the back dive is attempted, the part the head plays in diving must be thoroughly understood. It will guide the body through the air in the same way that the front planes of a flying machine guide its body. So in the back dive, if the chin is held high, forcing the head back, the body will go into the water almost straight. Therefore, in taking a back dive on the bed, in order to avoid striking the top of the head, the chin must be pulled in hard and kept there. When it comes to real water, the change can easily be made.

For the back dive, then, stand on the "springboard," feet together and heels


ARM MOVEMENT FOR THE CRAWL STROKE
Ready to Start; Exhaling
Left, Finishing; Right, Starting Pull
Left, Moved Forward; Right, Pulling
Left, Pulling; Right, Recovering


THE SINGLE OVER-ARM SIDE STROKE
First Position; Exhaling Commences
Under Arm Pulling; Upper Arm Recovering
Under Arm Finishing Its Pull; Upper About to Start
Under Arm Recovering; Upper Pulling; Legs Opening; Toes Pointed Toward the Shins
Under Arm Fully Recovered; Upper Brought Forward, Having Finished Its Pull; Mouth Breathing

over the end. The arms are raised to full length over the head, with the thumbs locked. Take a deep breath through the mouth, rise on the toes, and fall backward.

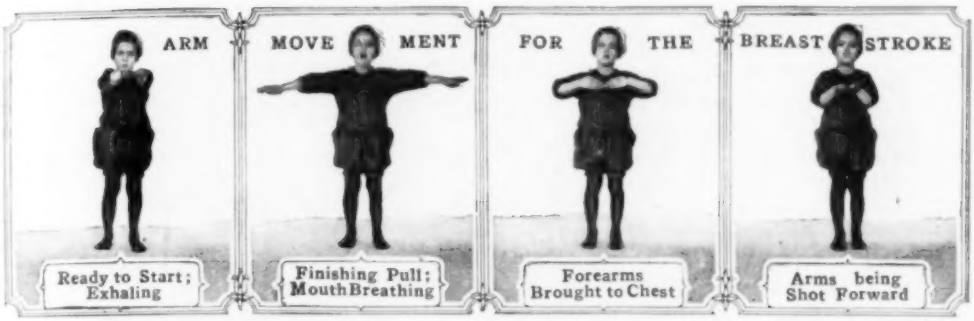
Other land exercises are practicable. Improve upon the sculling started in the tub. All that should be attempted is the shoving of the imaginary water away from the thighs and back again, with the palms of the hands. Have the arms kept straight and the stroke not too long. In the midst of the dog-paddle practice, the child can suddenly stop to cough, and then turn over and scull.

Sculling really consists of a swift, straight-arm movement, hands describing progressive figures of eight, and the palms always forcing the water away and down. They should travel in an arc of about 45°. In going head first on the back, the finger tips are held higher than the wrists, and as near the surface as possible. To reverse, sink the hands and lower the finger tips. Level hands simply support the body.

Perfect the straight-leg kick, both on the chest and on the back. The toes are pointed along the line of the shins and the legs moved from the thighs only. Avoid having the legs drawn up under the body as in crawling on the hands and knees. The kick on the back is easier, and it can be performed while sculling.

Let him learn the arm movements of the back stroke while on the back. The arms, which are at the sides, palms facing the legs and fingers extended and joined, are simultaneously recovered by having the hands describe semicircles at right angles to the floor. From the recovered position sweep them along the floor, palms leading and thumbs up, to their original position. Keep the arms straight during the entire stroke. To have the palms touch each other during a part of the recovery is helpful. The only pause is at the end of the pull.

As the little one grows older, teach him the breast-stroke kick, which is used in the back stroke. Begin with the recovery, keeping the heels on the floor all of the time. Draw up the legs


ARM MOVEMENT FOR THE BREAST STROKE
Ready to Start; Exhaling
Finishing Pull; Mouth Breathing
Forearms Brought to Chest
Arms being Shot Forward

with the heels kept together almost under the open knees. From this, the recovered position, straighten the legs to form an angle of about 45° and then, using the adductor muscles of the thighs, draw them smartly together. These two movements are so made that there is a pause between the kick and the recovery, but none at all between the recovery and the kick. On the recovery of the legs the toes are pointed toward the shins, and during the kick they are pointed to make a straight line with the legs, which are twisted so that the soles of the feet face each other.

To combine the arm movement and the kick, recover the legs during the last half of the arm pull, and kick as the arms are starting to recover. At the start of the recovery, exhaling should begin through the nose and continue until the first half of the pull, when, without pause, a quick inhalation through the mouth takes place.

Each arm stroke, for the alternate over-arm stroke on the back, is the same as in the first method, except that, while one is pulling, the other is recovering. The recovery is slightly delayed until after the start of the pull of the other arm. The breath is taken regularly on the finish of the pull of one arm, exhaling during the rest of the stroke. The kick is simply an up-and-down thrash, the movement being from the hip, toes pointed along the line of the shins. To teach it, have the child raise his left foot off the floor about six or eight inches, while the right arm is pulling, and immediately let it down again. The right leg is moved while the left arm is pulling. Or the legs can be kicked independently of the arms.

In teaching the arm movement for the crawl stroke, have the pupil stand with the arms straight out in front of the body, parallel with the floor and with each other, palms down. Start with either arm and force it downward, passing the thigh, and backward and slightly outward as it is raised. As the hand passes above the level of the shoulder, swing the arm, still held straight and slightly above the shoulder level, to its original position, keeping the palm down and thumb leading. The other arm starts its pull when the first one starts to go forward, and the movements are continuous, there being no pause between the pull and the recovery. Exhale through the nose at the start of one arm and, as it is finishing its pull, fill the lungs through the mouth and immediately begin exhaling again. Continue to inhale on the finish of the pull of the same arm.

For the single over-arm side stroke, start with the "scissors" kick, teaching it so that it can be performed equally well on either side. Let the pupil lie on the side with the head rest-

ing on the under arm, stretched out to make a straight line with the body. The upper arm rests on the hip. Both palms face downward. The upper leg goes forward, swung from the hip, and at the same time the lower one goes backward, swung from the knee. They are opened slowly and quickly snapped shut. The width depends somewhat upon the cadence of the stroke, but for the land drill about eight to twelve inches for the upper leg is right, and for the lower, have the shin at right angles with the thigh and the foot raised above the level of the knee. The ankles are flexed so that the toes point toward the shins while the legs are being opened, and along the line of the shins when they are snapped shut. To prevent the legs from crossing, have the upper foot rest against the lower at the finish of the kick.

For the arms, the start is made from the same position as in the kick. Recover the upper, keeping it straight, thumb leading and palm down, by carrying it forward, in front of the body and slightly above the level of the shoulders, to a position over the head and directly over the under arm. Then sweep it, palm of hand first and fingers extended and joined, to its original position, traveling below the level of the shoulder. Quickly inhale through the mouth at the conclusion of the pull and the start of the recovery, and exhale through the nose until it is time to inhale again.

Finally combine the arm movement and the leg kick, at first without the breathing, and later with it. As the upper arm is about half through its pull, slowly open the legs for the kick, and, as the arm starts its recovery, snap them shut. Or the old-style timing can be taught: open the legs as the upper arm is recovered and snap them shut as it pulls. After the kick and the upper-arm pull, and the breathing are acquired, the under arm can be tried. Raise the head slightly off and move the arm parallel with the floor, elbows straight, in front of the body to a position at the lower hip. This is done while the upper arm is being recovered, and the movement is the one used when the stroke was first swum. When it comes to swimming it in the water, the modern way is to dip the hand straight down so that a semicircle is formed at right angles to the surface.

Teach the arm movement for the breast stroke. Start with the arm stretched straight out in front of the body, palms down and thumbs touching, fingers extended and joined. To start the pull, twist the wrists so that the little fingers are raised and the thumbs are lowered. Sweep the arms, parallel with the floor, until they form a line with the chest, when the hands are brought to the breast by bending the elbows and moving the forearms. Without pause, the arms are shot forward to their original position. Breath is taken in through the mouth during the last half of the pull and let out during the rest of the stroke.

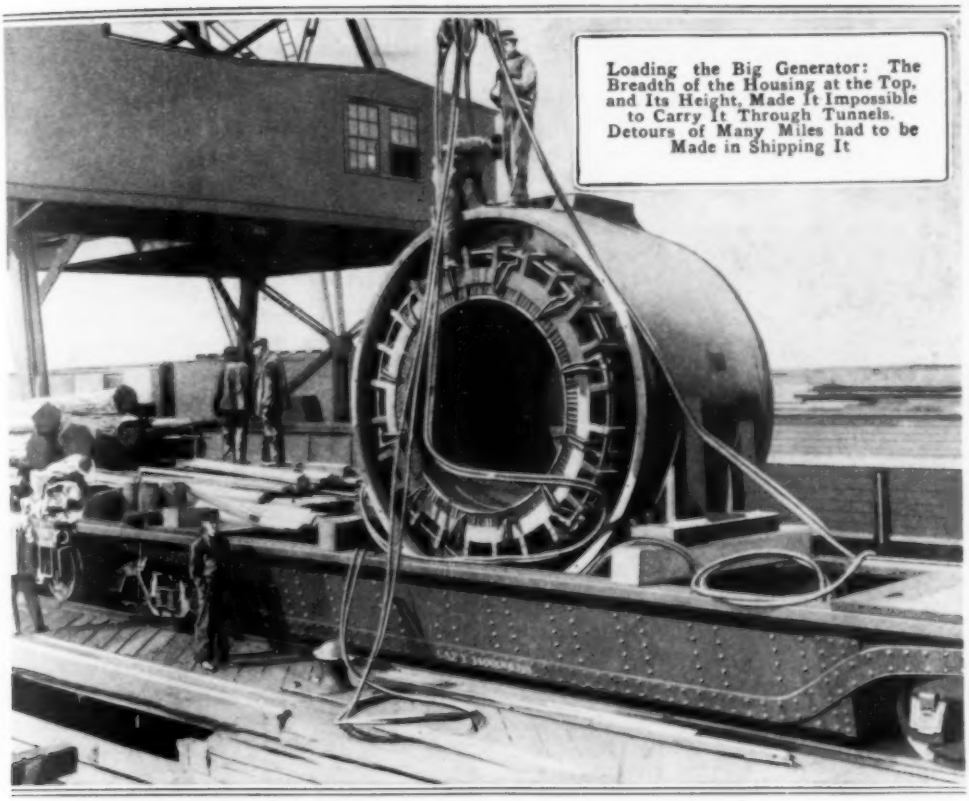
Practice the head-carry tow for life-saving by having two children lie on their backs with the rescuer's hands on either side of the other's head, over his ears, and with a leg thrashing up and down on either side of his body. The elbows must not be bent.

It must not be supposed that the writer necessarily advocates the teaching of all of the land exercises and dives at one time. The parents can proceed as fast as may be warranted, but movements should be thoroughly mastered, step by step.

(To be continued)

BIG GENERATOR IS SHIPPED WITH GREAT DIFFICULTY

One of the eastern railroad companies was recently confronted with a difficult problem in freight handling when it undertook to transport a large assembled generator from Greenville, N. J., to Joplin, Mo. The apparatus weighs 160,000 lb. and when placed in a well car measured 15 ft. 7½ in. from the top to the rails. This height, coupled with the fact that the housing was almost as wide as the inside dimension of the car carrying it, prohibited it

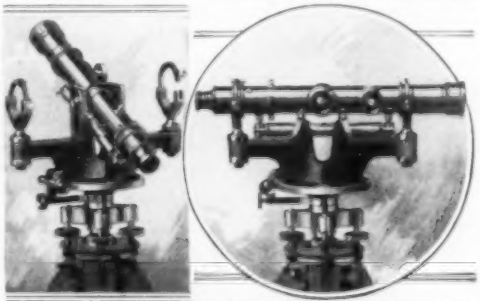


Loading the Big Generator: The Breadth of the Housing at the Top, and Its Height, Made It Impossible to Carry It Through Tunnels. Detours of Many Miles had to be Made in Shipping It

from being taken through tunnels. Thus it was necessary to arrange a routing, by making numerous detours, which would provide open track. The generator was built at Brooklyn and taken to Jersey City by water and turned over at the Greenville yards to the railway company, the only one out of a number which would agree to make the haul. As a rule railway tunnels are more than 15 ft. high at the center, but few of them have so great a clearance for the full width of the track.

NEW CONVERTIBLE LEVEL HAS HANDY FEATURE

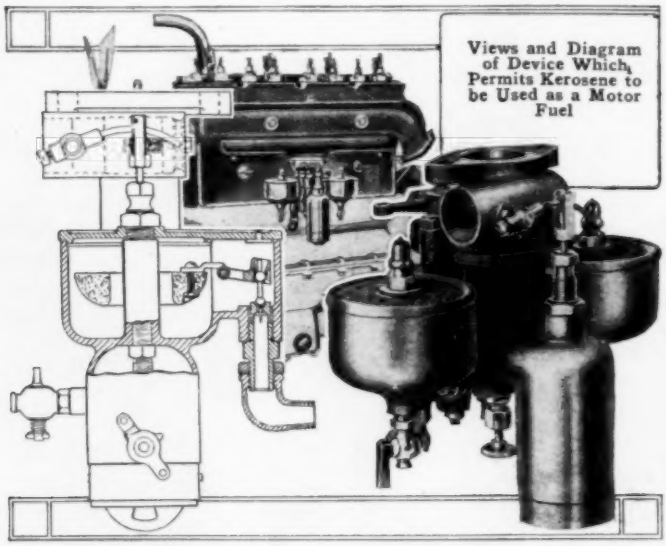
For the convenience of engineers, contractors, road builders, and others who have occasion to use a portable surveying instrument, a convertible level has been designed which may be changed into a transit in a few seconds. The telescope, having a level below it in active position, is mounted in standards which are cast integral with the crossbar. This is the attractive point of the device, for it makes it possible to use the instrument in either of its capacities without carrying around a set of standards which must be attached by means of thumbscrews whenever needed as a mounting for the transit. The crossbar is made with a drop center so that the telescope may be raised or lowered 45° from the horizontal.



The Standards and Crossbar Are in One Piece: This Makes It an Easy Operation to Convert the Level into a Transit

HEAVY OILS USED AS FUEL FOR MOTOR CARS

With the aid of a recently developed carburetor which is employed in combination with a vaporizer of special design, kerosene is used as a fuel for internal-combustion engines. The system is suited for both automobile and marine motors and constitutes the outstanding feature of a new car that has lately been announced. The vaporizer, which is also an intake and exhaust manifold, is designed to distribute heat, within certain limits of temperature, evenly throughout the mixture. A series of small staggered rods are cast integral with the intake tract. These are kept hot, and the fuel upon striking them becomes evenly heated and thoroughly vaporized before reaching the engine. The carburetor is made with two bowls and preserves the same fuel proportions at all working speeds. In order to warm up the vaporizer, the carburetor is started on gasoline. Both fuels are kept ready for the spray nozzle and are admitted as required by a fuel valve, acting in concert with the throttle, which automatically puts it on kerosene as the engine is opened up. With this system it has been found possible to burn even Oklahoma crude oil and similar heavy oils with paraffin bases.



Views and Diagram of Device Which Permits Kerosene to be Used as a Motor Fuel

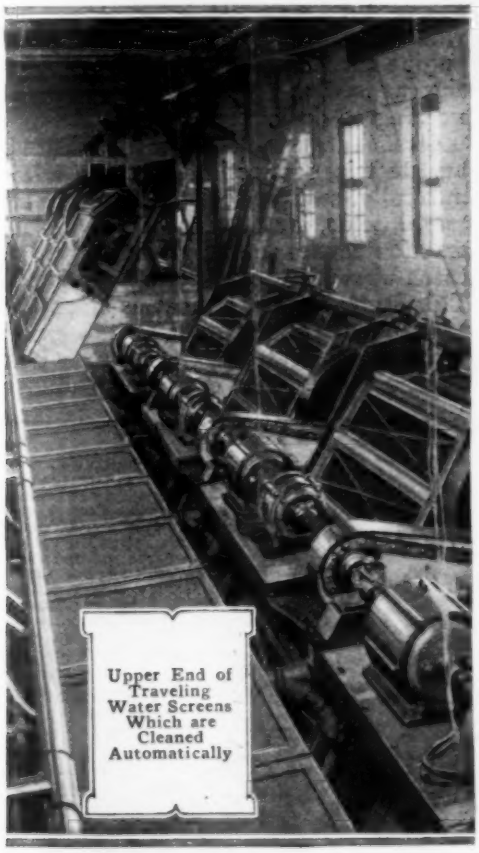
TONGS FOR HANDLING SNAKES

Pincers, which resemble curling tongs, are used by a Massachusetts naturalist in handling the most deadly snakes. One member of the pair of pincers, or tongs, is forked at its outer end; the other has a single prong. The handles resemble shear handles. The prong ends are covered with rubber and curved in such a manner that a snake can be grasped and held firmly without doing it injury. The naturalist on discovering a snake which he wishes to capture, pins it to the earth with a forked stick and then grasps it immediately back of the head with these pincers. In this way the most dangerous reptile can be handled with safety.

PROPOSE GREAT HIGHWAY TO LINK NATIONAL PARKS

A great circular highway which would connect the national parks of the West has been proposed by good-roads advocates. They contemplate asking Congress for $1,000,000 for the project and for assistance from the good-roads experts of the Department of Agriculture. The thoroughfare, as proposed, would start at Denver and

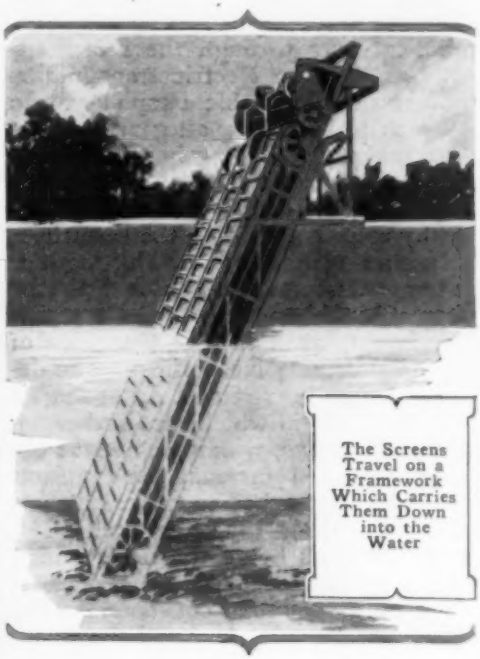
run northwest, passing through the new Rocky Mountain National Park, and enter Yellowstone by way of Cody, Wyo.; thence it would run through Idaho, Washington, and Oregon. The western arc of the great oval would include Yosemite and other scenic wonders of California. To the south it would traverse Arizona and New Mexico, and then would run northward to Denver. Supporters of this plan to make these great playgrounds even more accessible than at present point out that already the route is marked by many sections of good roads. A stretch from Cody through the Shoshone Cañon is said to be one of the most beautiful highways in the country. A portion of it has been cut through the solid rock. The entire route is 3,500 miles long.



Upper End of Traveling Water Screens Which are Cleaned Automatically

TRAVELING SCREENS CLEAN WATER FOR BOILERS

A traveling screen for cleaning circulating and boiler water in power plants has been devised by a Milwaukee concern to eliminate the necessity of cleaning and changing screens by hand. The device consists of a number of wire baskets, each having a narrow metal lip at what is normally its lower edge; these are mounted on two belt chains that run over sprockets located at each end of a steel framework, one end of which is immersed in the water. As these baskets revolve slowly, they screen the water that passes through them and bring up from the water the small particles which they have caught. On passing over the upper sprockets they drop a portion of their screenings in a trough, whence they are washed away. The cleaning of the baskets is completed by a spray which strikes them from the back, removing all remaining foreign matter. These traveling screens are operated by electricity and require very little attention.



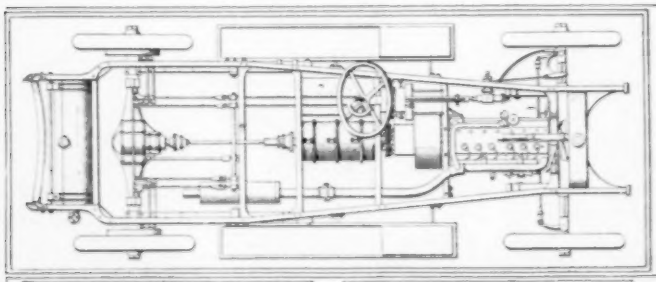
The Screens Travel on a Framework Which Carries Them Down into the Water

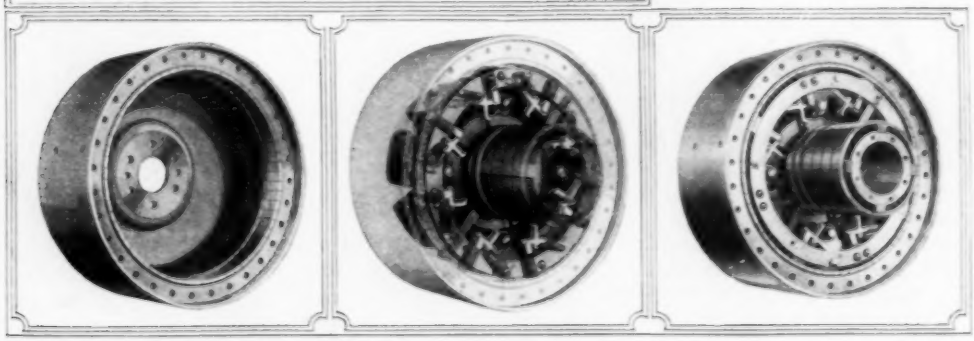
NEW TRANSMISSION SYSTEM FOR GASOLINE CARS

There is scarcely any possible refinement in motor-car designing more desirable at the present time than the complete elimination of the mechanical clutch and gear set. Apparently this has been accomplished in a thoroughly practical way through the recent development of an electric transmission system of remarkable simplicity. In addition to banishing all gear shifting, it makes engine stalling impossible and allows a car to be driven at any speed, from literally a snail's pace to its capacity, by merely operating the throttle.

Neither magnetic gear shifting nor power transformation enter into the plan. On the contrary, a motor generator is employed to take the place of the usual driving mechanism. The device consists in part of a drum-shaped armature, within which are fixed armature laminations, windings, and, at the outer edge, an internal commutator. This unit is attached to the crankshaft and corresponds to a flywheel. The propeller shaft holds the fields which are mounted inside of the armature. Thus, unlike ordinary construction, the fields are in the interior and the armature outside. Sixteen weighted, spring-held carbon brushes, a part of the field unit, press outwardly against the face of the internal commutator. Because of centrifugal force, these brushes exert a pressure against the commutator ring when the car is running. This becomes sufficient, when a speed of 15 miles an hour is attained, to prevent any slip between the fields and the armature, thus providing a direct mechanical connection between the crank and propulsion shafts.

To start, when the engine is dead, a button is pressed and a connection thus formed between the battery, armature, and fields. An automatic locking arrangement holds the latter stationary while the armature is revolved and the engine turned over. The operation of the car is even more simple. There is nothing to do but feed gas to the cylinders. When the throttle is advanced, an electric connection is made automatically, and the lock, holding the internal fields, is released. Magnetic attraction causes the fields to attempt to catch up with the revolving armature. This starts the car almost as smoothly as the stroke of a paddle shoots a canoe through the water. There is no jerk and no noise. The extreme flexibility





On the Left Is a Diagram Showing the General Arrangement of the New Electrical Transmission System for Gasoline Cars That Eliminates the Clutch and Gear Set. The Views Below Show the Drum-Shaped Armature and the Various Parts Which It Incloses. When the Car is Running, 16 Spring - Held Brushes Exert Pressure against the Commutator Ring through the Action of Centrifugal Force

of the device is apparent. The slip that occurs in starting does not represent lost energy, for it generates current which is stored in the batteries, and so can be drawn upon for service in the future.

A parallel and series switch mechanism constitutes the simple controller, the regulating buttons of which are conveniently placed on the steering column. When everything is normal, an engine can be started and a car actually put under way in five or six seconds. A car is started in "high." When it is running and the gas is suddenly shut off, electric connections are broken and the car coasts along freely; a new feature for motorists and one which saves fuel. The great flexibility of the connection between the engine and propulsion shaft prevents the transmission of road shocks to the motor itself.

Ninety-five per cent of the driving is direct. For emergency purposes, however, a power compound system is provided that gives any desired amount of torque. The same range of speed is given for both forward and reverse driving. Pressure upon a button changes a car from high into low, low into high, starts the engine, or causes the wheels to reverse. Four electric buttons are used, one of which is for neutral. Once the engine is started, it is only occasionally that any of these is employed, for the gas lever and brakes answer practically every need for average driving.

Contrary to one's first impression, the wear on the carbon brushes is negligible. On test cars this has been shown to be less than $\frac{1}{64}$ in. after 5,000 miles of heavy driving. Apparently they will outlive a car.

OBSERVE "FOURTH OF JULY" IN MARCH

Spectacular fireworks for Independence Day are denied the children and grown folks of Alaska for the simple reason that the nights are almost as light as the days in July, and it does not pay to attempt pyrotechnic displays if there is no darkness to show them off by contrast. Consequently it has become the custom in many Alaskan cities, including Fairbanks, to hold a "Fourth of July" celebration on March

Independence Day Fireworks at Fairbanks, Alaska, Displayed March Fourth Because There Is Too Much Daylight July Fourth

4, when the nights are still very long. Then there is abundant opportunity for displaying fireworks of every variety.

MEXICAN REFUGEE MODELS LIFELIKE WAX FIGURES

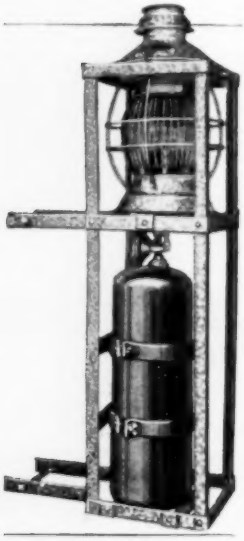
An aged Mexican refugee, now in this country, has produced several wax figures of Mexican street venders that are so realistic and accurate in detail that a set of these works of art has been placed in the national museum in Mexico City.

Realistic Wax Figures Modeled by an Aged Mexican Refugee

One of these represents a fish dealer wrought with such pains that the veins on his legs stand out distinctly and beads of perspiration show on his forehead.

ACETYLENE-GAS LAMPS MARK FISH POUNDS ON COAST

For the purpose of meeting the comparatively recent requirements of the United States government regarding the marking of fish pounds with reliable lamps, an Atlantic fisherman devised an acetylene lamp which was approved by the government and is now widely used on the Atlantic coast. Fish pounds are made by fishermen by so fastening their nets to piles, a mile or more from the shore, that they form a trap having a funnel-shaped entrance; once fish enter these traps they cannot find their way out. The officials at Washington ruled in 1914 that these pounds should be marked with lamps that would burn at least 20 hours without attention. The lamp now in general use is fed from an acetylene-gas cylinder with a capacity of 70 cu. ft. of gas, and will burn from 23 to 35 days according to the size of the flame. The lamp itself is of a storm-proof marine type, showing red to the landward and white to the seaward. It is inclosed in the upper end of a heavy galvanized angle-iron framework; the lower two-thirds of the framework is occupied by the gas tank, fitted with an automatic reducing valve to keep the flow of gas constant. The entire outfit is fastened to a pile at a point at least 10 ft. above high water.

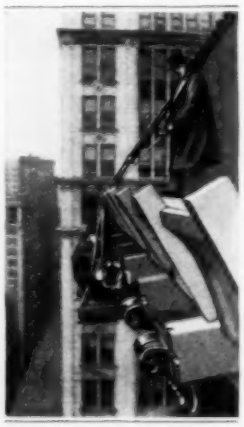


AMERICAN SHIPBUILDING EXCEEDS BRITISH

For the first time in many years the shipbuilding in American yards exceeds that in British yards. For the three months ended March 31, American yards launched 173 merchant vessels of 94,464 gross tons, while the British yards launched 69 vessels of 80,561 gross tons. Merchant ships now building and under contract in this country are approximating those of the British, as these comparisons show: In American yards 31 vessels between 8,000 and 12,000 gross tons are under contract, in British yards, 26; in American yards 77 vessels between 5,000 and 8,000 gross tons, in British yards, 68; in American yards 39 between 3,000 and 5,000 gross tons, in British yards, 74; in American yards 44 between 1,000 and 3,000 gross tons, and in British yards, 62. The British builders are constructing 16 steamers of more than 12,000 gross tons. The totals are 191 vessels of more than 1,000 gross tons in American yards, and 246 in British yards.

ORNATE CORNICES MENACE LIFE OF PEDESTRIANS

That many high office buildings are adorned with embellished cornices and ornaments so constructed as to be a menace to those in the streets below is shown by a recent accident in Chicago's business district which might very easily have proven fatal. Because of improper construction the action of the elements loosened a heavy ornament on the cornice of a tall building and finally it crashed to the street. A portion went through a sign having heavy

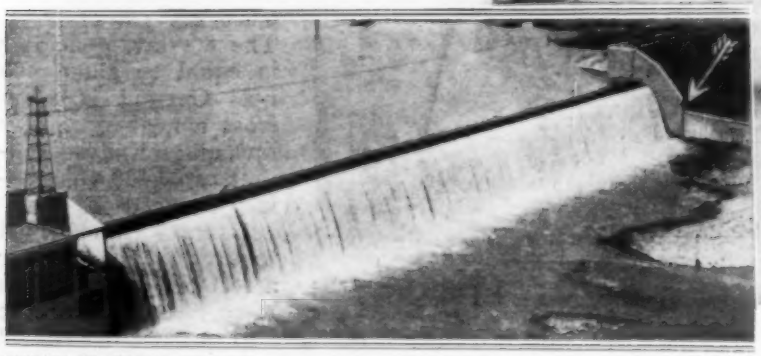


glass letters; another piece cut through an automobile top; a piece of the mortar split a pedestrian's hat and knocked a cigar from his mouth, and one fragment broke through the cement walk, which was reinforced with ½-in. rods. The accident cost the building owners $400 all told.

Investigation showed that water had seeped in between the edge of the cemented top of the cornice and the copper facing, and had trickled down to iron beams which projected over the street. These beams had terra-cotta ornaments bolted to them. As the beam and bolts became rusted the ornaments became loosened, and one finally fell. After this occurrence all the ornaments of this character were removed. The steeple jack who did this work declares that many cornices are so designed that pockets collect water which freezes and loosens the ornaments or makes them subject to rust, and so they become a public menace.

HIGH WATER CAUSES STRONG DRAFT IN GALLERY OF DAM

A feature of a power dam across the White River at Powersite, Mo., is a 900-ft. gallery running through the structure from the power house to the shore. It is situated just behind the sheet of water which flows over the dam and is partly open on the downstream side so that one can look out into the falling water. When there is a small overflow the gallery is frequently filled with mist blown about by a moderate breeze. But when the volume of water increases to a sheet 12, or even 14 ft. thick, which is the maximum recently reached, the breeze is transformed into a terrific draft which is so strong as to make it unsafe to attempt to walk along the passageway even though there are iron rails to keep one from plunging below. Employes were unable to leave the power house for several days recently because the high water made such a strong draft in this gallery.



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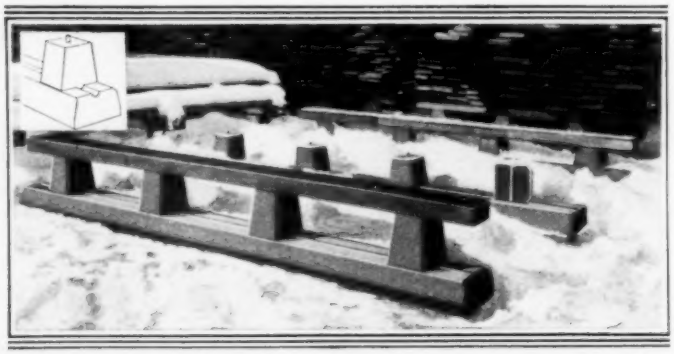
When a Sheet of Water 12 Feet Thick is Flowing over the Dam through Which This Gallery Runs It Is Unsafe to Pass through Here on Account of the Terrific Draft of Air Caused by the Falling Water

CONCRETE SUPPORTS FOR LUMBER PILES

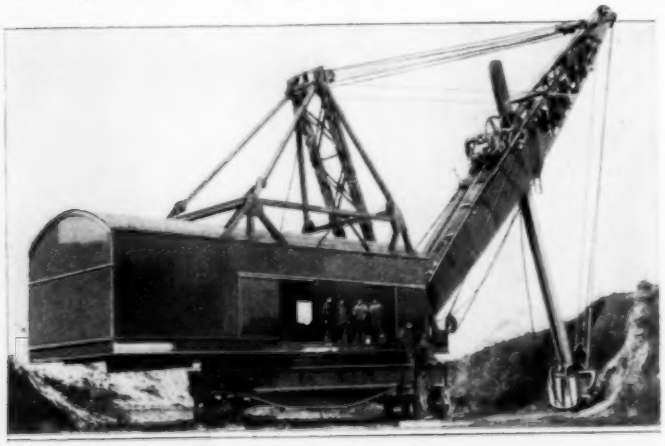
Concrete supports for lumber piles are now being used by a number of lumber concerns instead of wooden supports, which retain moisture and frequently impart fungi of a harmful character to the lumber. Each support consists of a reinforced-concrete beam which lies flat upon the ground and to the upper side of which reinforced-concrete pedestals are attached to support a wooden stringer of desired dimensions. One design of the concrete beams calls for a groove extending along the center of its upper side. Into this is fitted a tongue in the lower end of each pedestal. The pedestals also have an iron dowel which projects from the upper end about 1½ in. This fits into a corresponding hole in the stringer, making the whole support a stable unit. Pedestals may be made of various heights, ranging, for example, from 10½ in. to 6½ in., so that the lumber may be piled on a slant. The supports, being portable, can be arranged for piles of any width and length.



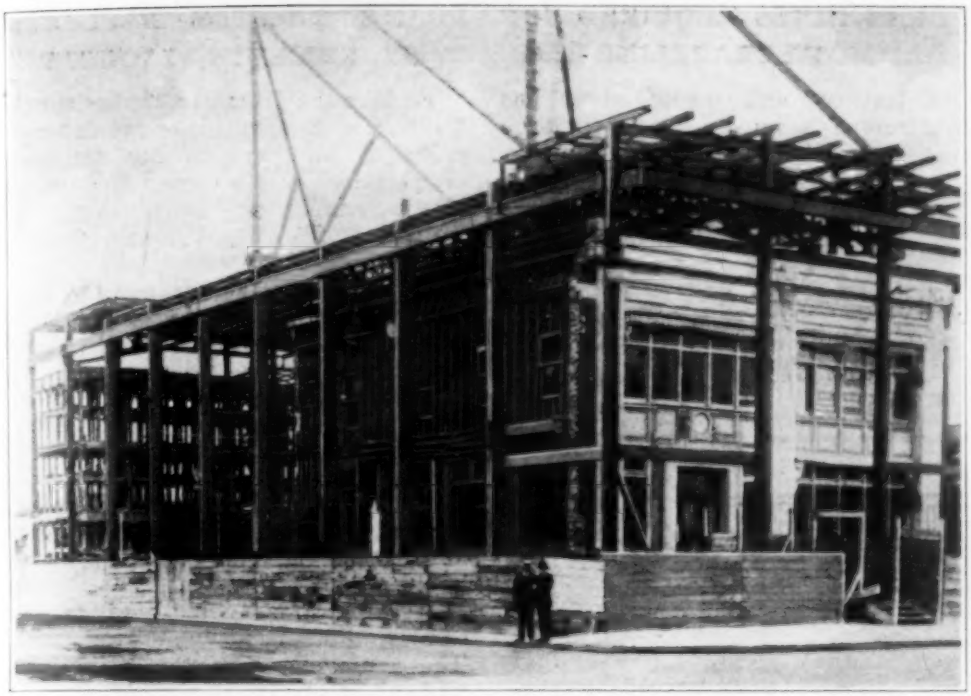
Lumber Supports of Reinforced Concrete, Having Concrete Pedestals and Wooden Stringers That Are Detachable

MAMMOTH ELECTRIC SHOVEL USED IN COAL FIELDS

A power shovel which is operated by electricity and weighs 325 tons has recently been installed by an Ohio coal company to strip off the earth above veins of coal. It is said to be the largest electrically operated shovel in the world. The machine has a 90-ft. boom and can dig to a depth of 55 ft. and throw dirt to a height of 110 ft. above the lowest point of excavation. The dipper is 6 yd. wide, and together with the dipper stick weighs 75 tons. In nine hours the shovel can displace 6,000 cu. yd. of earth. The 300-kw. generator is equal to about 400 hp. Current is taken from a near-by trolley line, an alternating current of 66,000 volts being reduced to 4,400 volts and transformed to direct current. After a test of several weeks it was stated that the current required to operate the shovel cost less than would have been the cost of steam; this would be increased by



This Electric Power Shovel Weighs 325 Tons and can Remove 6,000 Cubic Yards of Dirt in Nine Hours. The Dipper Is Six Yards Wide



The Old Building is Razed Part by Part as the Offices at the Rear of the New One are Completed

the expense of getting the coal up from the vein to the level of the power house, which of course moves with the boom and the rest of the machinery, and so would involve frequent shifting of lifting apparatus. The machine successfully underwent a severe test by loading 1,000 tons of coal in a nine-hour day with the temperature 17° below zero. Steam shovels frequently cannot operate in such weather because of the freezing of their feed pipes.

OLD BUILDING IS OCCUPIED AS NEW ONE INCLOSES IT

While a new and larger building is being erected on the site of its old one, a Detroit banking house is escaping the inconvenience of taking temporary quarters by remaining in the original structure and moving gradually into the rear of the other as its offices are made ready. The new building, which is being constructed with steel, completely surrounds the one it is to replace, and when finished will have triple the capacity of the latter. The smaller structure is being razed at the back and cleared away part by part as the work progresses. The exterior of the new bank will be faced with stone and the inside finished in marble.

FIRE HYDRANTS PROTECTED BY BOLD SIGN ON CURB

An ordinance passed by the authorities of San Bernardino, Cal., specifies that no vehicle shall be allowed to stand within 15 ft. of a fire hydrant. That innocent persons may not disregard the restriction unwittingly, the fire chief has had both the hydrant and the adjoining curb painted red. On this red strip indicating the forbidden area appear the words "Keep Away" in large white letters.

THREE HIDES REQUIRED FOR MAMMOTH TRAVELING BAG

A leather-goods manufacturer has constructed a traveling bag so large that three hides were required in making it. When resting on the ground the handle of this mammoth container is almost even with a man's hand hanging in its normal position. The bag, which was made for advertising purposes, is 54 in. long and 2 ft. high.

This Great Traveling Bag, Which was Made as an Advertising Novelty, Is 54 Inches Long and About Two Feet High

FRAME TRESTLE REPLACED BY CONCRETE VIADUCTS

To take the place of a timber trestle 2,177 ft. in length, two reinforced-concrete viaducts of the open spandrel-arch type have been constructed on the Puget Sound line of the Chicago, Milwaukee & St. Paul Railway, a short distance out of Rosalie, Wash. These structures carry the track across Pine Creek, the rights of way of two other companies, and a wagon road. A fill was made on the east bank of the creek, forming an embankment 334 ft. long which separates the viaducts. The easterly one is the smaller of the two and has a 100-ft. arch flanked by girder spans on high piers. The other structure has a length of 502 ft. There are three arches of 68½-ft. span and of the same general design as the big one in the east viaduct, and another similar, though unsymmetrical, arch. The arrangement of the latter span was necessary in order to provide clearance space for a sharp skew crossing, and was also influenced by the ground slope. A skew opening is provided, to accommodate the railway which is crossed, and a trestle and U-abutment, the latter bridging the highway. The structures are built on a three-degree curve. The cost of their upkeep will be less than that of the deteriorating wooden supports.

Southwest View of Both Concrete Viaducts and the Fill Which Replace a 2,177-Foot Timber Trestle, near Rosalie, Washington

Two Automobiles, Fitted Up for Overland Travel, Recently Purchased by a Band of Gypsies

GYPSIES USE AUTOMOBILES INSTEAD OF HORSES

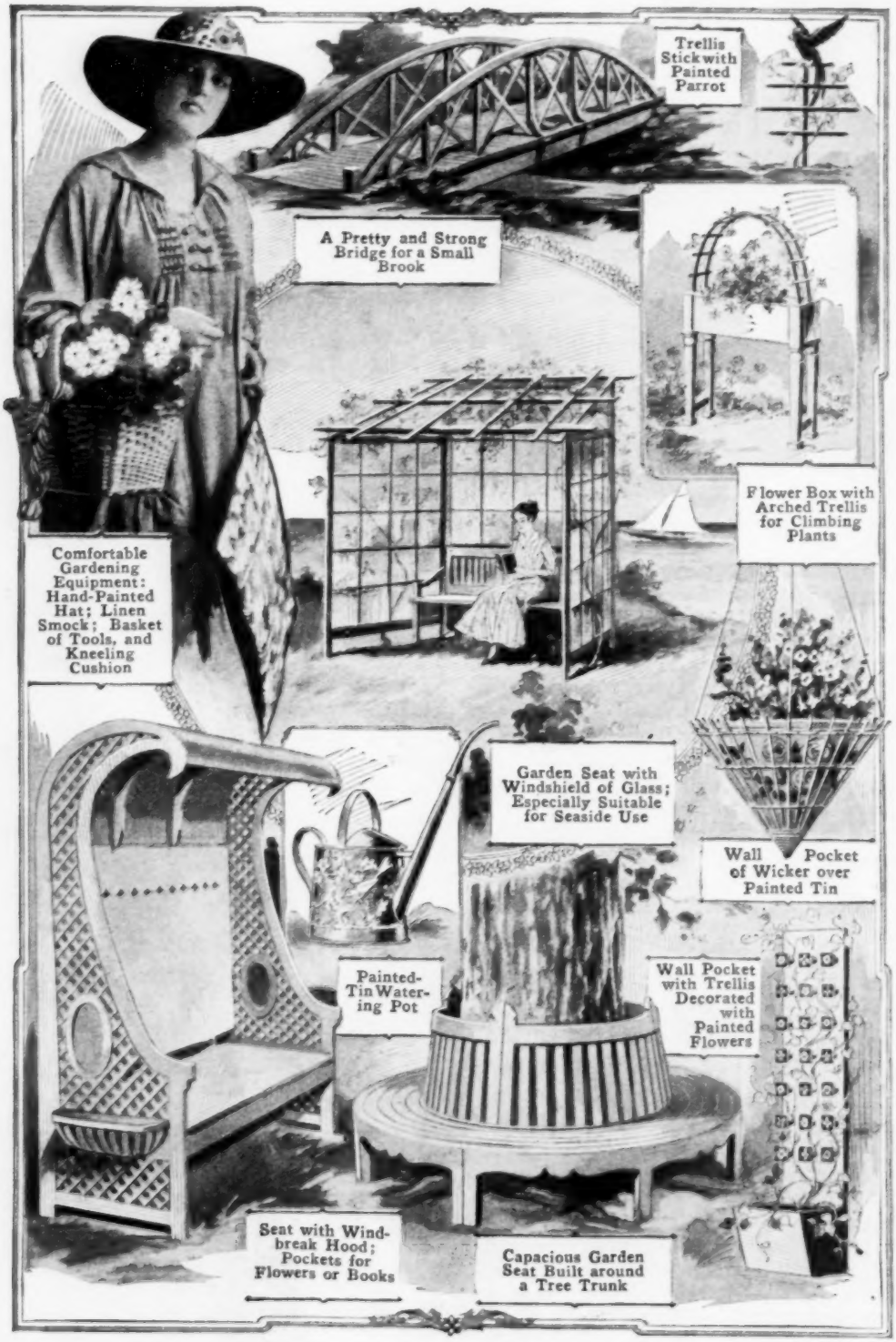
Even gypsies are abandoning horses for motors. A band of about 40 of these nomads recently visited Columbus, Ohio, traveling in three covered automobiles which had been purchased a short time before. The leader of the gypsies said that the cost of the cars was $3,000, $1,000, and $750, respectively. Each motor was fitted up in true gypsy fashion, and portions of the tops were painted in the bright colors characteristic of the familiar gypsy wagons. In all, three families inhabited the three cars. The sage of the group was a woman 75 years old; the youngest of the children was three months old.

SMALL OXYGEN FLASK USED TO REVIVE GAS VICTIMS

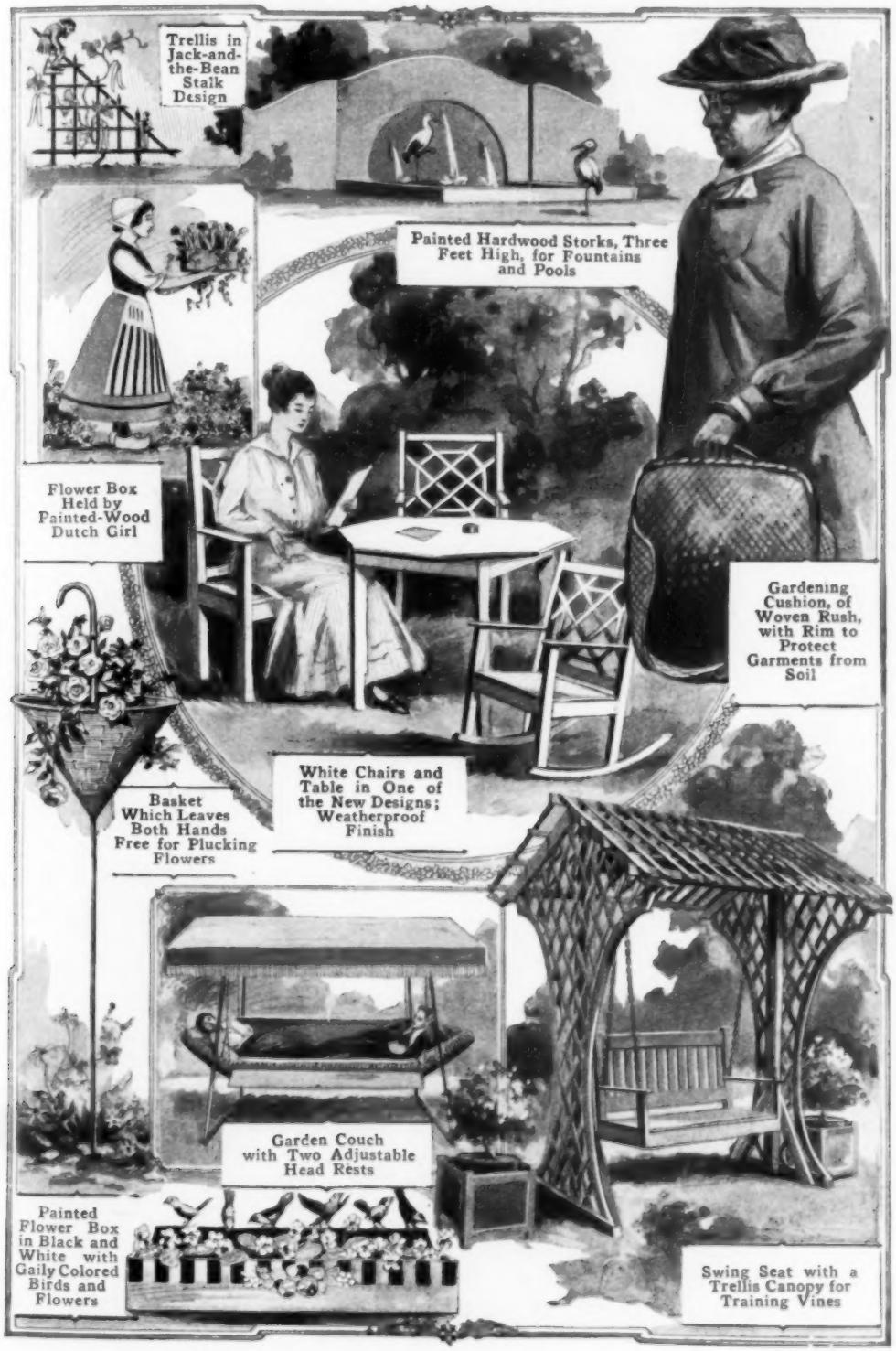
To enable the timely treatment in the trenches of soldiers partly asphyxiated by poisonous gases, a pocket-size resuscitator for field surgeons and first-aid nurses is being made in France. It consists of a flask filled with about 10 quarts of compressed oxygen and connected with a rubber bag having a flexible tube and nozzle. When a valve provided in the neck of the bottle is turned, the gas flows into the bag and slowly expands it. By then squeezing the latter the oxygen is forced through the administering tube to the patient. Since such cases demand that pure oxygen be given at the earliest possible moment, this portable outfit is apparently of considerable value. The ordinary apparatus is cumbersome and makes it necessary for patients to be carried to it instead of it to them.

Pocket Oxygen Apparatus Used in the Trenches for the Treatment of Soldiers Overcome by Gas

ARTISTIC GARDEN FURNISHINGS AND ACCESSORIES

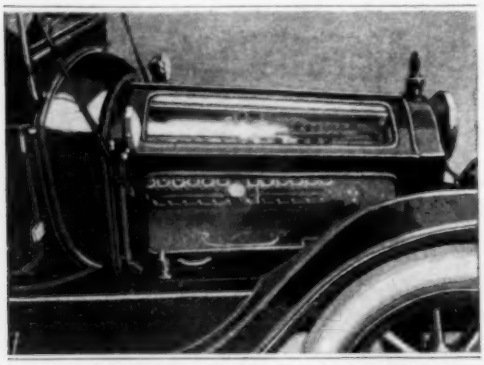

Trellis Stick with Painted Parrot
A Pretty and Strong Bridge for a Small Brook
Flower Box with Arched Trellis for Climbing Plants
Comfortable Gardening Equipment: Hand-Painted Hat; Linen Smock; Basket of Tools, and Kneeling Cushion
Garden Seat with Windshield of Glass; Especially Suitable for Seaside Use
Wall Pocket of Wicker over Painted Tin
Painted-Tin Watering Pot
Wall Pocket with Trellis Decorated with Painted Flowers
Seat with Windbreak Hood; Pockets for Flowers or Books
Capacious Garden Seat Built around a Tree Trunk

SUITABLE FOR BOTH LARGE AND SMALL ESTATES


Trellis in Jack-and-the-Bean Stalk Design
Painted Hardwood Storks, Three Feet High, for Fountains and Pools
Flower Box Held by Painted-Wood Dutch Girl
Gardening Cushion, of Woven Rush, with Rim to Protect Garments from Soil
White Chairs and Table in One of the New Designs; Weatherproof Finish
Basket Which Leaves Both Hands Free for Plucking Flowers
Garden Couch with Two Adjustable Head Rests
Painted Flower Box in Black and White with Gaily Colored Birds and Flowers
Swing Seat with a Trellis Canopy for Training Vines

MOTOR-CAR HOODS WITH GLASS PANELS

Automobiles with hoods in which plate-glass panels have been inserted



A Type of Motor-Car Hood Which Is Convenient for Demonstration Purposes

are being used by motor-car salesmen, and others, as a novelty and for advertising purposes. In some instances the interior of the hood is lighted at night with hidden electric bulbs. Such a machine standing at the street curb is sure to attract the attention of passers-by. An engine, for example, which does not throw any oil shows off to very good advantage under a hood of this character, the inside of the glass remaining clean with very little attention. In certain cases car owners have used glass panels molded to fit the curves of the hood. This produces an elegance of finish that is very pleasing to the eye.

¶English commercial houses are being urged by the British Chamber of Commerce for Italy to take steps immediately to develop their trade relations with the southern kingdom and prevent German and Austrian firms from again dominating the field after peace is established.

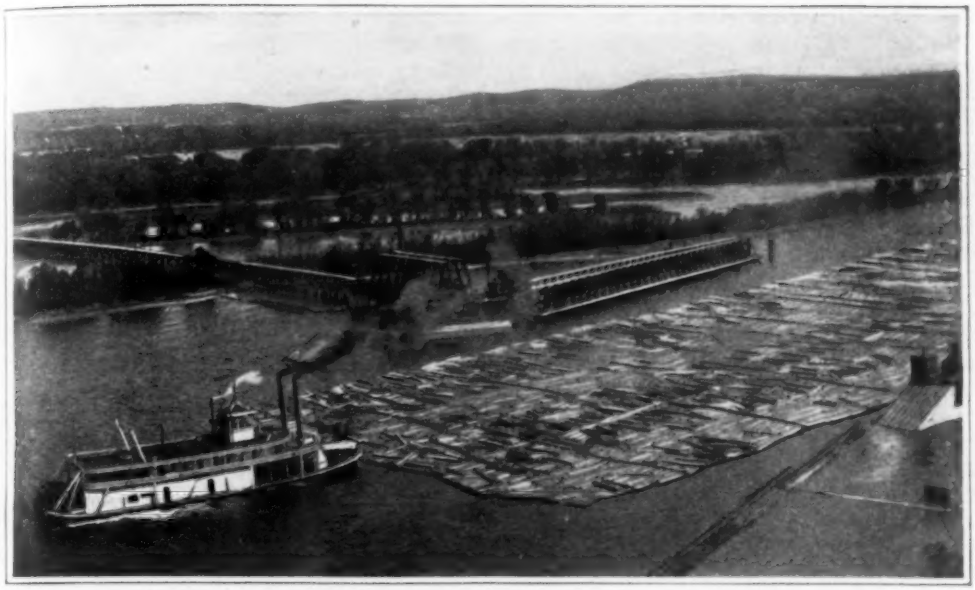
SUNSHINE TREATMENT GIVEN TUBERCULAR CHILDREN

For the care of children who are afflicted with tuberculosis in its incipient stages, the city of Buffalo has established a hospital at Perrysburg, N. Y., where the outdoor sunshine treatment is administered. This method consists chiefly in keeping the patient in the open with practically all of the body exposed to the rays of the sun. The system attracted notice some time ago when it was first put into practice by a French physician in the Alps. When the

Pure, Rich Milk, an Absence of Clothing, and Lots of Sunshine and Exercise Soon Show Results

When the Weather Permits, the Children Sleep in the Open Air

Girls Who are Suffering from Tuberculosis in Its Early Stages, Picking Flowers along a Country Road



One of the Large Lumber Rafts being Convoyed down the River. Until Late Years This has Been One of the Familiar Sights on the Mississippi

weather permits, the children at the Perrysburg hospital spend nearly all their time in the fields and along the country roads. At night they sleep in the open air. They are encouraged to romp and exercise judiciously and are kept on a diet. In many instances the children respond quickly to the treatment and show marked improvement after a comparatively short time.

PASSING OF BIG LOG RAFTS OF THE MISSISSIPPI

This year will probably mark the passing of one of the most picturesque phases of Mississippi River life. It is considered likely that the last great log raft from the lumber camps of the North has passed down the Father of Waters. In the past, millions of feet of timber have been leashed together with chains and floated hundreds of miles downstream to the mills. Of late years this once common practice has been steadily decreasing. The big forests adjacent to the stream have given way to the woodchopper's ax. Last year only one lone raft was floated south, while this year, it is announced, there will be none. Hereafter the logs will be shipped by rail or in the fast steel barges which are now being built to revive Mississippi River traffic.

TWELVE - HUNDRED - YARD SPAN OF TELEPHONE WIRE

One of the longest stretches of telephone line between poles that exists anywhere is to be found at Ruby,

Ruby, Alaska, Where a Telephone Line Extends across the Yukon River, the Distance between Supports Being 1,200 Yards

Alaska, where a wire has been suspended across the Yukon River a distance of 1,200 yd. The camp of Ruby had not been settled long, before the people who lived there wanted better communication with the outside world. A telephone line was planned to connect with the telegraph line of the United States Signal Corps. A single wire of plow steel was manufactured in Boston for the purpose. It was brought to Alaska at great cost, being expressed across the continent to Seattle, then taken by steamboat to Cordova, carried 110 miles by rail to Chitina, and finally brought several hundred miles by special messenger and dogs, who made their trip in 16 days. The wire extends from bluff to bluff across the river, being 250 ft. above the water at the lowest point. One dollar is charged for every message telephoned to the telegraph station.

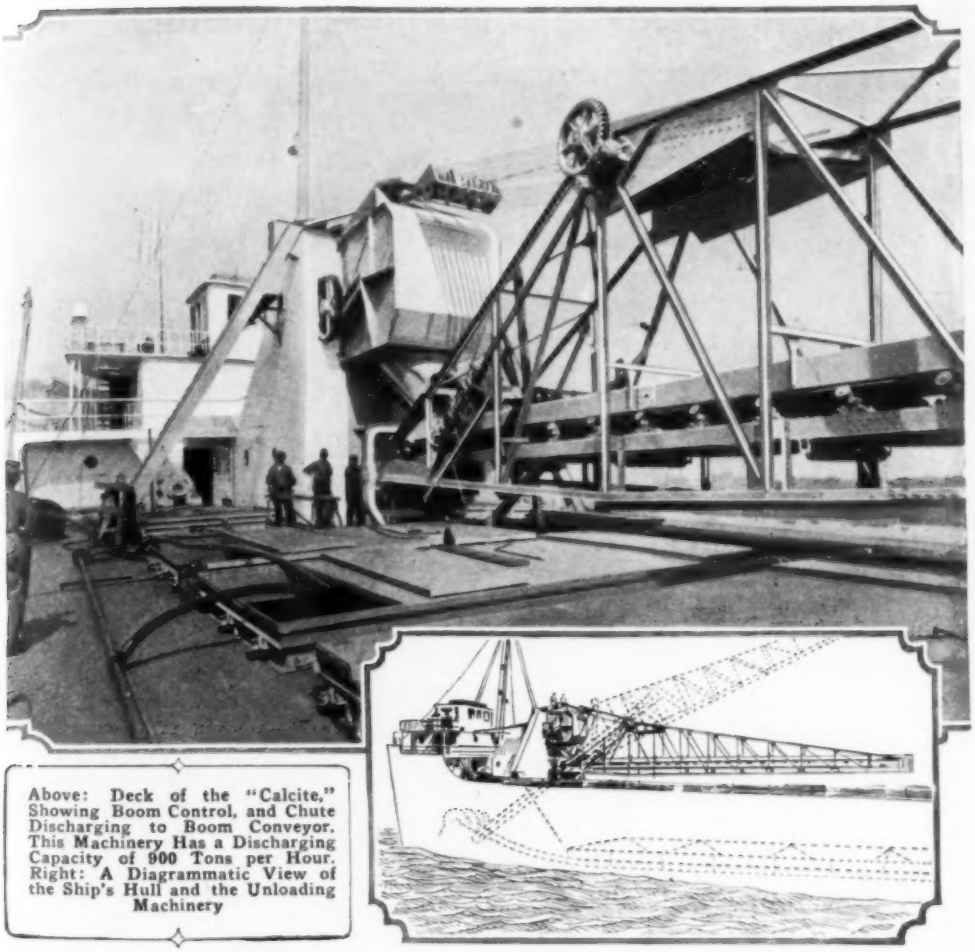
MILITARY TRACTOR STANDS SEVERE TESTS

Six military tractors of the caterpillar type have been purchased by the government to haul the 4.7-in. siege guns of Battery C of the 5th Field Artillery at Fort Sill, Okla. This purchase was made after one of the machines had been subjected to most severe tests, which included pulling a siege gun through a mudhole in which the artillery wheels sank up to the hubs; climbing steep hills; passing through gullies, and driving over railroad bridges. All of these feats the tractor performed with remarkable facility. The large number of horses which formerly hauled these guns will be transferred to the lighter artillery.

LARGE LAKE SHIP EQUIPPED WITH EFFICIENT UNLOADER

In order that it may be independent of poor port facilities, the freighter "Calcite," which handles bulk cargoes on the Great Lakes, carries its own unloading equipment. The steamer, the largest of the self-discharging boats navigating the lakes, is 436 ft. in length and has a cargo capacity of 8,300 tons. Its machinery enables it to unload at a rate of about 900 tons an hour, which means that it can clear its hold in a day's time with ease. Two long, parallel rows of hoppers, each of the latter having a spout and gate on the under side, form the bottom of the ship's cargo space. Conveyor apparatus consisting of big steel pans mounted on moving chains of the roller type extend beneath each line of hoppers. These discharge into a bucket elevator which rises through the deck and deposits the

One of the Tests of a Military Tractor Which Preceded a Purchase of Six of These Machines by the Government



Above: Deck of the "Calcite," Showing Boom Control, and Chute Discharging to Boom Conveyor. This Machinery Has a Discharging Capacity of 900 Tons per Hour. Right: A Diagrammatic View of the Ship's Hull and the Unloading Machinery

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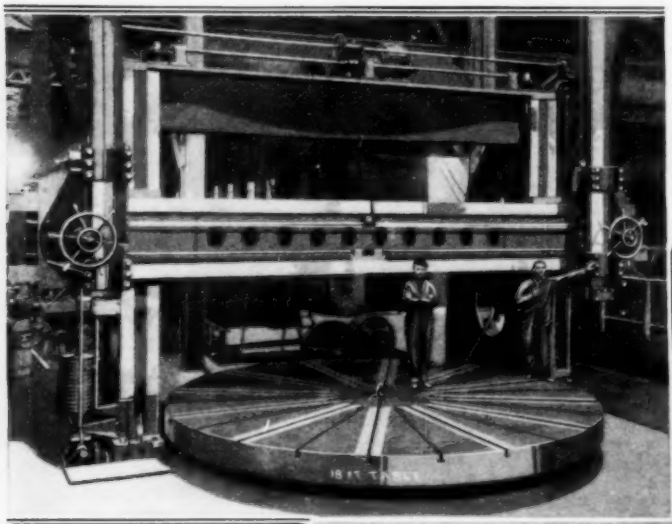
material into a bin which feeds a 90-ft. belt conveyor held by a heavy steel framework, or jib, that may be swung out over a wharf. The latter part of the equipment is installed a short distance forward of midship, so as to accommodate the bucket elevator, which is inclined at a 45 ° angle from the bow.

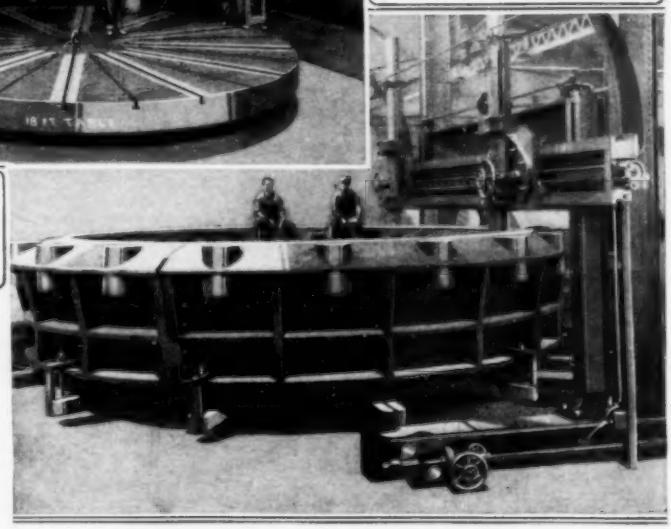
PIPE SYSTEMS IN ORCHARDS SIMPLIFY SPRAYING

To facilitate spraying during the spring of the year when the ground is frequently too soft to accommodate heavy tank wagons, several California pear growers in the vicinity of Sacramento have installed elaborate underground pipe systems in their orchards. In each, at a central point, a mixing and pumping plant is provided. On one 20,000-tree orchard a 10-hp. motor is employed to force the spraying preparation into the pipe system under high pressure. At regular intervals throughout the orchards service cocks are available. Convenient lengths of hose are connected with these, and the spraying is done in essentially the same manner as if wagon outfits were in use. The equipment is of sufficient capacity to permit the maintenance of about a 200-lb. pressure while 20 or more nozzles—enough to spray approximately 18,000 trees in a day—are in use. One-inch pipe is employed for the feed line, and ¾-in. tubing for the branches.

VERTICAL BORING MILL OF BIG DIMENSIONS



A Vertical Boring Mill of Unusual Dimensions: The Table on Which the Workmen are Standing Is 18 Feet in Diameter



A Huge Casting Set in the Boring Machine, Which Is Capable of Accommodating Work 31 Feet in Diameter

To meet steadily increasing requirements of heavy work, a large manufacturing firm has built for its own use a milling tool of very unusual dimensions. This tool is a two-head vertical boring mill and has an 18-ft. table. By varying the relative positions of the table and the head bridge, work up to 31 ft. in diameter and 9 ft. high can be accommodated. Some conception of the size of this machine is gained by comparison with the height of the workmen shown in the two accompanying illustrations.

COLORED PHOTOGRAPHS MADE BY NEW PROCESS

By a simplified process of color photography, which differs only slightly from a system devised a couple of years ago, as many pictures as are desired may be produced from the original negatives. The camera used is so arranged that two plates are held at right angles to each other, one being placed in the usual position at the back, and the other in a horizontal plane at the top. Interposed between the lens and direct plate is a nickel mirror mounted at a 45-degree angle. This is perforated with a large number of holes cut at a certain slant. Light rays are projected by the lens upon the perforated mirror, half of them passing through the holes and focusing upon the rear plate and the other half being reflected and focused on the upper one. The two plates are made sensitive to color by chemical treatment; one being immersed in a solution that causes it to record red and orange rays, the other treated to register green and blue. Placed immediately in front of the direct plate is a green screen, and before the indirect

one a red screen. The result is that green hues are the most dense on one negative and the reds the strongest on the other. Positive plates, in black and white, are then printed from these and colored by a special process; the image transferred from the "green" negative being dyed red and the "red" one green. In doing this the transparent parts of each are protected against discoloration, for they become the whites in the ultimate picture. The next and final steps consist of placing the two plates together, registering the images, stripping off the emulsions, and mounting them on paper, ivory, or other material.

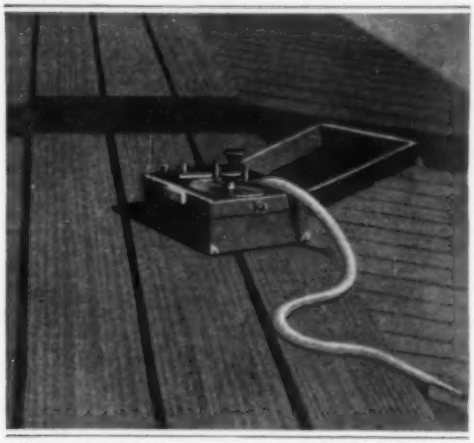
"PRAIRIE SCHOONER" BODY FOR PIONEER'S CAR

A 12-cylinder automobile with a body very suggestive of the prairie schooners of earlier days is to be used by an energetic and picturesque pioneer of 85 years who is about to make his fifth trip to the west coast over the famous Oregon trail, which starts in Missouri and terminates at Olympia, Wash. The earlier journeys were made with the genuine prairie schooners drawn by ox teams. For many years the owner of this unusual car has been an advocate of good roads and this trip also is undertaken in that cause. His car is comfortably furnished inside with a cook stove, provision shelves, bedding, etc. By lowering the rear door to a point level with the floor and extending the canvas, additional room is furnished in which to make up a bed.

"Prairie Schooner" Automobile in Which a Pioneer will Make His Fifth Trip over the Oregon Trail

EXPERTS SEEK PROPER PLAN OF FRUIT REFRIGERATION

In an endeavor to determine the most satisfactory method of refrigerating California fruit during its shipment to the East, a comprehensive investigation is being conducted by the Bureau of Plant Industry. This is being accomplished by icing cars according to different plans, keeping a careful record of temperature variations while en route, and finally examining the fruit upon its delivery at its destination. Four cars of oranges, recently shipped from Redlands, Cal., to Chicago and points east, were iced under government supervision and accom-



Thermometer Indicator on a Refrigerator-Car Roof by Which the Temperature of the Fruit within the Car can be Observed

panied by representatives of the bureau. All of the cars were new and of the same type. One was precooled and iced to its destination, another precooled and iced at regular stations, the third iced once, and the fourth precooled and reiced at a station close to the starting point. Twelve thermometers were placed in each of the cars. A terminal wire was led from each instrument into an orange and indicators placed outside of the cars so that readings could be made at specified intervals and without opening the doors. A number of similar shipments have been made from other points.

ROWBOAT EQUIPPED LIKE A WHEELBARROW

One member of a colony of fishermen on the Maine coast recently invented a means of making it easier to draw his rowboat back and forth over the hard sand of the wide beach. At the forward of its keel he fastened a wheel which projected slightly below the level of the keel. At the stern he put two handles. This enables him to take hold of the handles just as he would a wheelbarrow and easily move his craft on land. The other fishermen have profited by his example and equipped their boats in a similar manner.

A Fisherman's Rowboat with a Wheel at the Bow and Handles at the Stern, by Which It can be Easily Drawn across the Beach

POTATO FLAKES FOR FODDER AND HUMAN FOOD

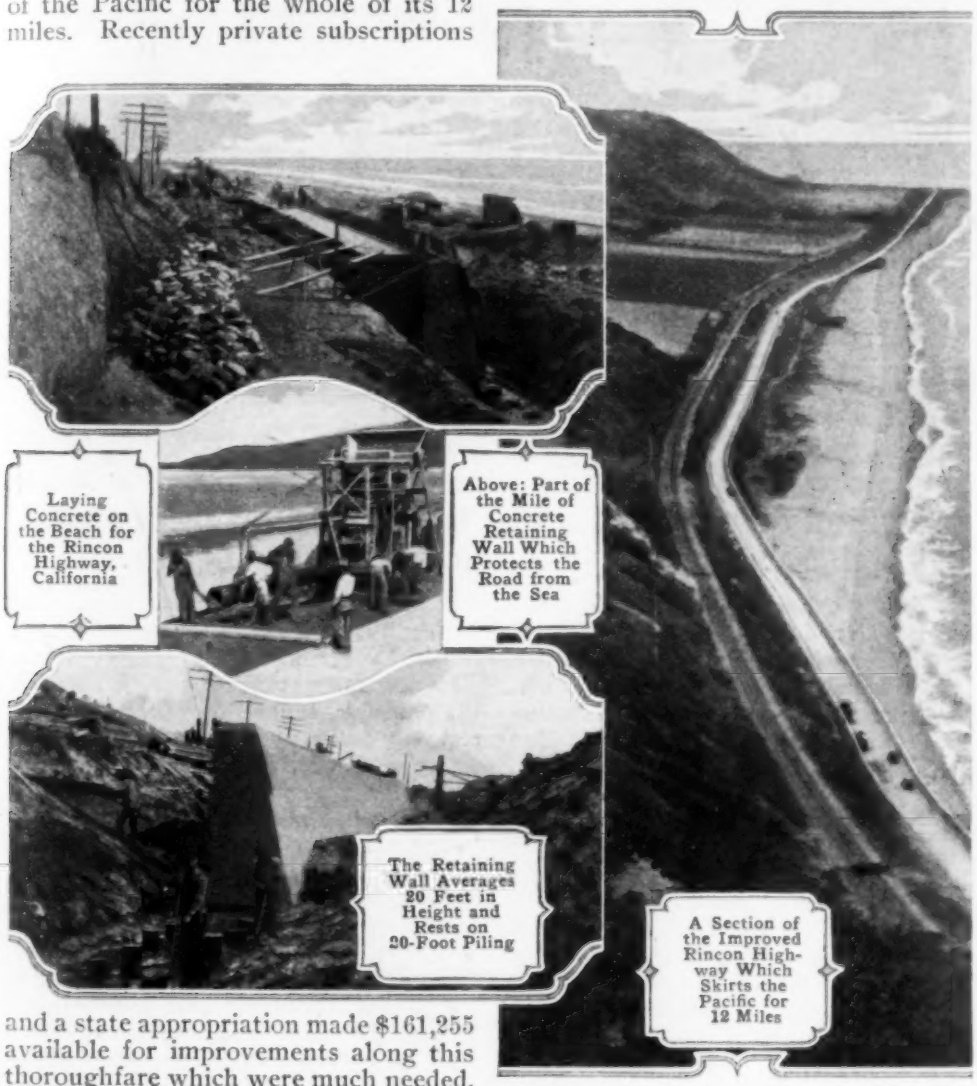
A new method of preparing potatoes for commercial purposes is being employed in Sweden whereby the vegetables are reduced to potato flakes. After being washed the tubers are carried on an elevator to a cylinder where they are cooked by steam. Following this they are ground to a mash which is dried by being passed between heated rollers. On cooling, the thin layers become brittle and are broken up into small fragments or flakes. When the mass passes through the rollers the skins adhere to the machine. These flakes are used both as human food in connection with baking bread, and as fodder; in preparing the latter the potato skins are utilized also. This prepared food can be easily transported and stored.

NEW TREATMENT FOR BALSA MULTIPLIES WOOD'S USES

Balsa wood, one of the lightest of woods, promises to be used much more than heretofore because an effective method of waterproofing it has been found. It is claimed that the new treatment also preserves it, prevents warping, and protects it against various marine pests which infest tropical regions so that now the wood becomes available for many marine purposes. This new process can be applied to other woods also. Balsa wood when treated in the new way can be used as a nonconductor of heat. It is predicted that it may be very generally used in making refrigerators, containers, etc. Because of its great buoyancy this wood is regarded as an excellent material for life preservers, life buoys, and rafts.

LARGE SUM IS SPENT ON SEA-LEVEL HIGHWAY

One of the many California highways which have been improved in recent years is the road from Ventura to Santa Barbara that follows the shore of the Pacific for the whole of its 12 miles. Recently private subscriptions and a state appropriation made $161,255 available for improvements along this thoroughfare which were much needed. The Rincon sea-level highway, as it is called, now has stretches of retaining wall between it and the sea, which aggregate a mile in length and cost $18,000. These walls are of concrete and average 20 ft. high, 6 ft. wide at the base, and 2 ft. wide at the top; they are imbedded about 10 ft. in the earth and rest on piling which extends 20 ft. farther down. Another feature of this road is three wooden trestles which extend across shallow water to eliminate long detours; one of these causeways is 4,000 ft. long. Nine months were required to complete the recent improvements made on the highway, the average expenditure being over $12,000 per mile. As in the case of other improved roads in the state, much concrete was used. This route offers a great variety of scenery, and is proving very popular.

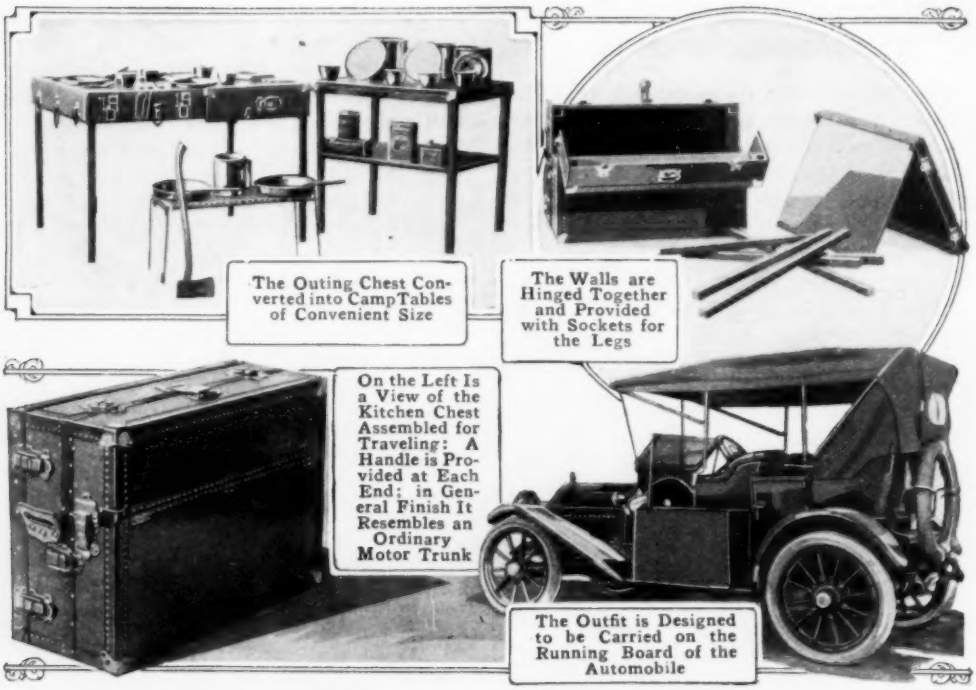


Laying Concrete on the Beach for the Rincon Highway, California

Above: Part of the Mile of Concrete Retaining Wall Which Protects the Road from the Sea

The Retaining Wall Averages 20 Feet in Height and Rests on 20-Foot Piling

A Section of the Improved Rincon Highway Which Skirts the Pacific for 12 Miles


The Outing Chest Converted into Camp Tables of Convenient Size
The Walls are Hinged Together and Provided with Sockets for the Legs
On the Left Is a View of the Kitchen Chest Assembled for Traveling: A Handle is Provided at Each End; in General Finish It Resembles an Ordinary Motor Trunk
The Outfit is Designed to be Carried on the Running Board of the Automobile

NEW TYPE OF TURNBUCKLE AND SOCKET BOLT

A saving in weight and length, a decrease in cost, and increased strength and reliability, are the advantages claimed for an improved socket bolt and turnbuckle now being made by an eastern manufacturer. The socket is made of drop-forged steel in one piece with the turnbuckle bolt end, thus eliminating the necessity for a turnbuckle eye and separate open socket with pin. The body of the turnbuckle is also a solid drop forging. This short and extra-strong device can be used to advantage in many places.

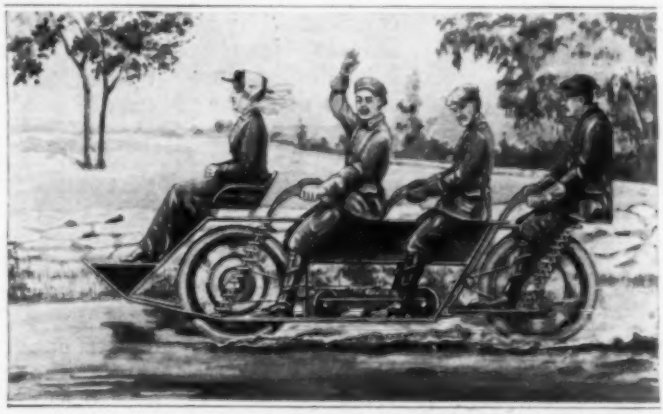
¶Tests are being made in supplying crushed coal to steam-producing furnaces by the same method that oil is utilized. It is claimed that by using this same process in smelting, a great saving in coal can be effected.

MOTORISTS' KITCHEN CHEST CONVERTIBLE INTO TABLES

A case for an automobile cooking and dining outfit has been designed which can be converted into two camp tables. This transformation is possible because the parts are hinged together in a special way and a portion can be detached entirely to make the smaller table. The container measures 12 by 20 by 30 in., and can be carried on the running board of a car. It is made of fiber and has a waterproof cover to keep out the rain and dust. One of the tables which can be made from this article is 30 by 40 in.; the other is 20 by 30 in. and has a shelf underneath. The legs for these tables are removable and can be carried in the case. Accompanying each case are cooking and camp utensils, including plates, pots, pans, knives, forks, spoons, four stools, and an ax, all of which can be packed in the chest. In its general construction and in the style of hinges and lock the container resembles an automobile trunk of the ordinary type and in an emergency it can be used as such.

MOTORCYCLE DESIGNED FOR FOUR PASSENGERS

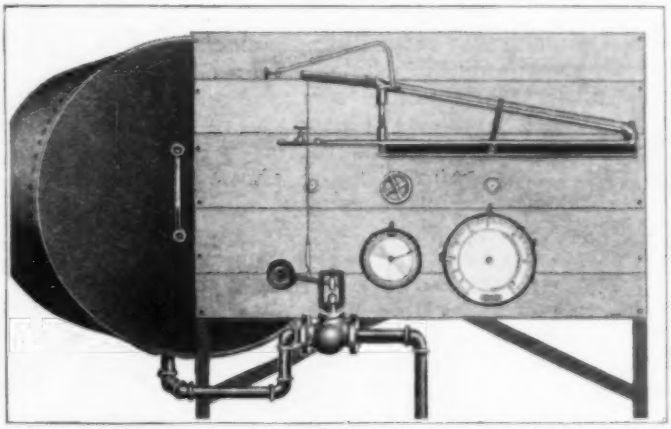
A design for a four-passenger motorcycle has been prepared by an English engineer. The frame is of a double trapezoidal type and the two wheels have a shock spring above them and a recoil spring below them. The motor is designed to burn kerosene; it is of the two-cylinder, water-cooled type with two pistons per cylinder. It has two crank shafts that are coupled by means of a rod having worm gears. This rod drives the camshaft, magneto, and water pump. The final drive is by belt to the front wheel; steering is done by the rear wheel. The foremost passenger sits in a basket seat mounted over the front wheel; each of the others has handlebars before him and has a regular motorcycle saddle. Four-inch tires are used; the wheel base is 66 in. No reports have been received as to whether one of these machines has been manufactured or what practical tests have been made, if any.



A Motorcycle Designed to Carry Four Passengers and to Use Kerosene for Fuel

OPERATION OF FEED-WATER REGULATOR IS SHOWN

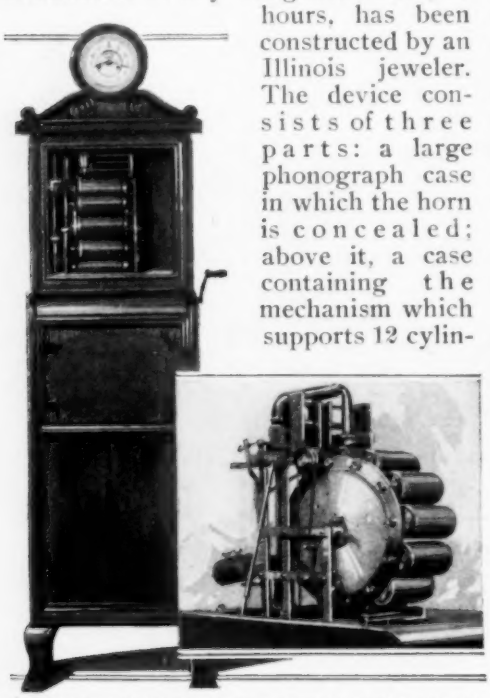
In order to indicate graphically the action of a feed-water regulator, an ingenious display board has been designed by an Erie, Pa., firm. On a slab, 8 ft. long and 5 ft. wide, the drum of a boiler connected by a feed pipe and equipped with a gauge, is painted. A control valve, cut away to show its inner construction and method of operation, is fitted to the feed line, while connected above is a standard boiler-feed regulator. A steam-flow meter, which indicates and records the load of a boiler, and an instrument for registering the water input, are used. The water gauge is of ground glass and is set flush with the surface of the board, at the back of which is an electric lamp. The rays from this are diffused evenly through the glass, permitting a light-tight, movable slide to represent the stage of the water. The apparatus is connected with an electric motor and driven in such a way that every three minutes its operation is thoroughly demonstrated.



The Display Board Shows a Feed-Water Regulator Properly Connected with a Boiler. The Complete Operation of the Apparatus is Graphically Shown Every Three Minutes

CLOCK PLAYS RECORDS INSTEAD OF CHIMES

A phonograph clock which plays one or more selections on a phonographic attachment at any designated hour, or hours, has been constructed by an Illinois jeweler. The device consists of three parts: a large phonograph case in which the horn is concealed; above it, a case containing the mechanism which supports 12 cylindrical phonograph records, and a clock which surmounts the whole. The records project horizontally from a wheel which is set in vertical position and revolves automatically so as to bring the cylinders in place under the phonograph needle. This apparatus is operated by a spring motor; the records, if desired, can be played independently of the clock. At the back of the timepiece, attached to the center pinion and working in unison with the minute hand, is a series of four switches which can be so set that a different record will be played every 15, 30, or 60 minutes; or the clock can be set to play only once in 12 hours. When a large phonograph is used the whole mechanism stands about as high as a hall clock.



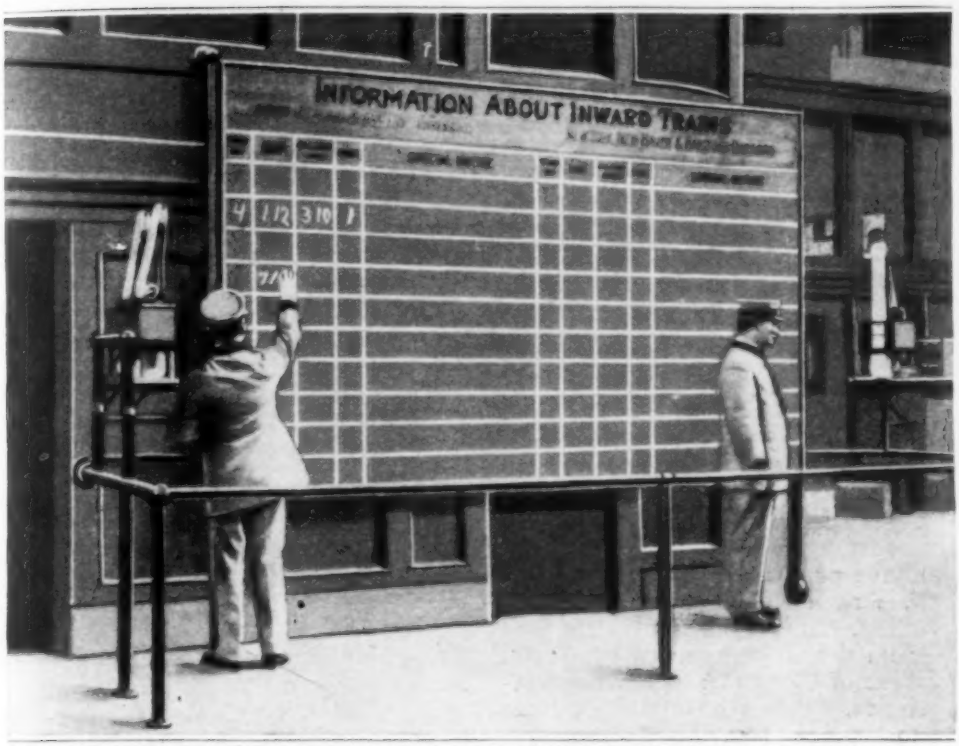
A Phonograph Clock Showing Case in Which Are 12 Cylindrical Records. At the Right is Shown the Mechanism Which Supports and Revolves the Records

NOVEL FEATURE EMPLOYED IN RESILIENT WHEEL

The feature of a resilient wheel which has recently been patented is a series of spheres or rollers situated between an outer and an inner rim. The inner surface of the outer rim and the outer surface of the inner rim are made up of a series of angular segments, or curved sections—depending on the design of the wheel—so positioned that each sphere or roller rests in a pocket that is narrower at either end than it is at the center. Side plates, fastened to the outer rim and inclosing these rollers or balls, lap over the inner rim, and are so designed that they keep the dust out entirely. It is this two-rim construction, together with the intervening movable members, that is designed to give the wheel its resiliency, because these intervening members permit the outer rim to turn slightly on the inner one. In this way a shock is dissipated by the rollers or balls as they roll a little way up the converging sides of their pockets. These rolling members may be inflated rubber or hard rubber, or laminated steel rings.

A Resilient Wheel the Feature of Which Is an Outer and an Inner Rim with Rollers between Them That Allow the Outer Rim to Revolve Slightly on the Inner One

When automobile wheels are of this type, rubber tires or iron rims may be used, it is claimed.



Train Information is Communicated to the Bulletin Board from the Dispatchers' Offices and Yard Tower by Means of Telautographs

ELECTRIC WRITING-SYSTEM TRAIN ENUNCIATOR

Telautographs have been installed in one of the railway passenger stations at Boston to expedite the announcement of train arrivals. The train dispatchers' offices of the two railroads using the terminal, and the yard tower, are equipped with transmitters, while receivers are placed at the bulletin board in the station concourse and in the train master's office. Information intended for the board is transmitted directly to the marker and announcer by these telegraph writing machines and likewise conveyed at the same time to the train master.

¶ Because of England's need for radio operators, phonograph records of wireless calls have been produced so that amateurs may continue their studies without infringing upon government regulations.

DEVICE HOLDS TELEPHONE RECEIVER TO THE EAR

A holder for a telephone receiver which permits one using the telephone to have both hands free for taking notes, looking up references, etc., has been put on the market. The holder consists of a metal base in which is a circular opening of the proper size to hold a telephone instrument. The base supports a post from which projects a pivotally fastened arm, having its outer end fashioned like a human hand. When properly adjusted a telephone receiver can be deposited in this hand and the user of the telephone can carry on a conver-

sation without tiring either arm by holding a receiver to his ear. Where one has two telephone lines, calls which are almost simultaneous can be answered with greater convenience by means of this device.

WALNUT LOGS BEING BOUGHT FOR ALLIES' GUNSTOCKS

Walnut wood, once so much in demand for furniture, is again commanding high prices. But this time it is being used to make gunstocks for the armies of Europe. What is said to be one of the largest gunstock factories in the world has recently been opened in Chillicothe, Mo. Three city blocks in the town are piled high with walnut logs. They have been gathered by a force of more than a thousand buyers who have purchased timber from Missouri, Arkansas, Iowa, Illinois, and Nebraska. In many instances the logs are from the walnut groves which are a feature of thousands of middle-western farms. Prices have ranged from $10 to $300 per log. In the Missouri factory the walnut is only made into rough stocks, which are shipped east to be finished.

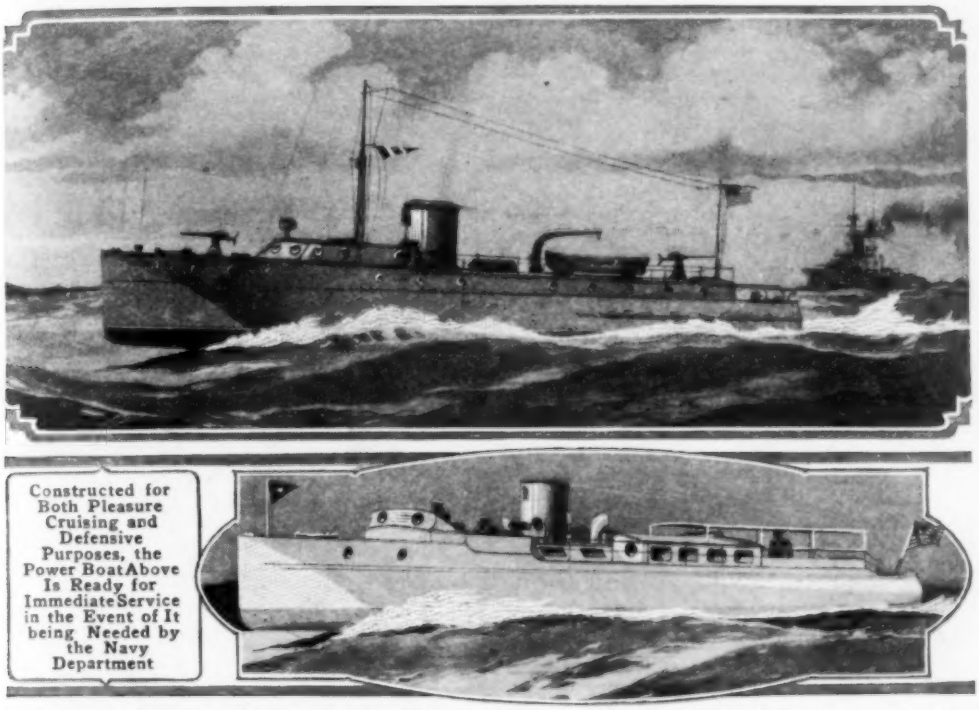
MAY BE ABLE TO FORECAST STORMS FORTNIGHT AHEAD

By means of what is believed to be a new scientific discovery, it is claimed that weather forecasts may be made with reasonable accuracy two weeks in advance. As a result of research, conducted by a former chief of the Weather Bureau and a representative of the Smithsonian Institution, it has been found that there are rifts in the upper clouds of the solar atmosphere which cause a variation in the amount of heat radiated to the earth. It is said the investigators have discovered the period of time between the passage of a heat rift in the solar atmosphere and the appearance of resulting storms on the earth. It has been found that at times these heat rifts persist for several months and that they have produced corresponding disturbances here.

¶Government engineers are coöperating with large manufacturers of engines in an effort to develop a more efficient aeroplane motor than this country now produces, so that the United States may be wholly independent of foreign makers.

These Walnut Logs Are a Part of an Accumulation Covering Three City Blocks in Chillicothe, Missouri. They are to be Used in Making Gunstocks for the Armies of Europe

MOTORBOATS DESIGNED FOR PLEASURE AND WAR



Constructed for Both Pleasure Cruising and Defensive Purposes, the Power Boat Above Is Ready for Immediate Service in the Event of It being Needed by the Navy Department

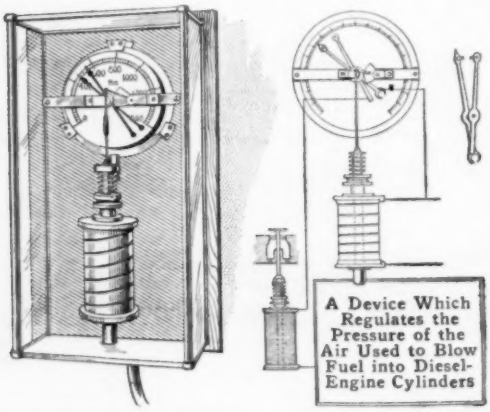
This Swift Craft, Designed by a Naval Architect, could be Converted into a "Scout Boat" in Short Order: It is Built for Peace and Suited for Fighting to Preserve It

As an indirect result of the valuable service rendered by power boats during the conflict abroad, some little attention has been aroused in this country to the advisability of organizing a "mosquito fleet" for mine patrol and scouting duties. A plan contemplating the registration of all pleasure craft of this kind, so that they might be available for service in an event of war, has even been proposed. Of late, however, another step has been taken in this direction which is particularly significant and interesting. Several easterners are having "scout boats" built for their private use. These have been designed by naval architects and are not merely suitable, but in part equipped, for naval purposes and would be practically ready for immediate use if necessity should ever require that they be turned over to the Navy Department. One of these little vessels is 63 ft. long, 11 ft. across the beam, and powered with "twin-six" motors capable of developing a total of 900 hp. It is intended to have a maximum speed of 40 miles an hour, a cruising radius of from 500 to 600 miles, and be capable of riding a fairly heavy sea. It is being fitted with a gyroscopic stabilizer and steering set, a complete radio equipment, a double electric-lighting system, and two guns, the caliber of which is yet to be determined by the Navy Department. Its owner will use it for pleasure cruising in the vicinities of New York and Palm Beach during the summer and winter, respectively, but would place it at the disposal of the navy should war develop.

AIR REGULATOR FOR DIESEL-ENGINE COMPRESSORS

An automatic device for regulating the pressure of the air which is used to blow fuel into the cylinders of Diesel engines has been produced by an English firm to take the place of regulation

by hand. Current from a dynamo driven by the engine is passed through a coil in such a way that it controls a pointer operated like that of an ammeter. In this case, however, the



A Device Which Regulates the Pressure of the Air Used to Blow Fuel into Diesel-Engine Cylinders

pointer is arranged to move around the dial of a pressure gauge and to show the blast pressure which is most suitable for the engine for the power being generated at the moment. The pressure gauge is connected with the blast pipe and has a second pointer, which indicates the pressure of the blast. Both pointers are provided with contact pieces at their outer ends and are insulated from each other, but connected with a battery. This battery is also connected with a solenoid in which is a plunger. The plunger operates an air-compressor throttle valve that normally is open. As long as it remains wide open the pressure in the blast receiver rises regardless of the engine's load because the compressors are made with a margin of capacity.

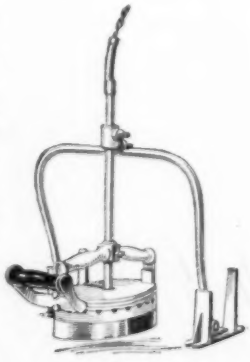
Suppose, for example, that the engine is running and that the pressure in the air receiver is lower than that indicated by the pointer which shows the proper pressure for the load. The air compressor will rapidly increase the pressure until the gauge pointer comes in contact with the other pointer. When this occurs the current flows through the solenoid, drawing down the plunger. This results in the throttle valve being closed while the pointers remain in contact. When the pressure falls the contact is broken and the throttle reopens. In this way the pressure in the receiver is automatically regulated according to the engine's load.

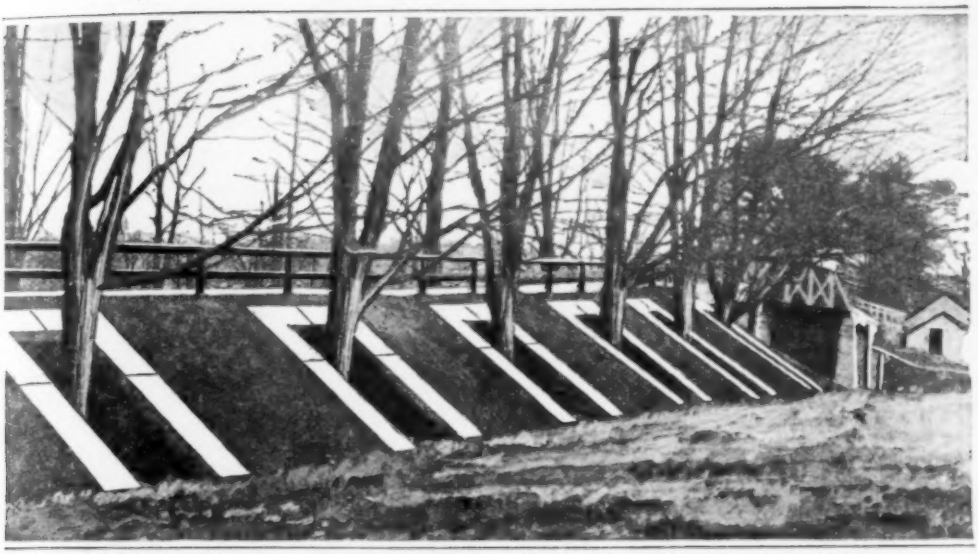
MOVIE PROGRAMS IN LUMBER CAMPS PREVENT SPREES

Motion pictures have been performing an unusual service in the woods of northern Wisconsin by entertaining the lumberjacks in the employ of a certain concern and indirectly curbing their desire to go to town on every pay day and spend all their earnings. This habit of engaging in a debauch at the end of each month has also cost the lumber companies much, because after each wild affair a lumberman generally drifts to another camp to secure new employment. The concern in question furnished its men with a new movie program nightly, for a small fee, which was gladly paid. These entertainments were so successful in keeping the men contented that other companies are thinking of offering similar attractions.

ELECTRIC IRON FOR HEAVY OR LIGHT WORK

An electric iron which can be adjusted quickly for heavy or light work has been designed by an eastern manufacturer. It is provided with five movable plates, each weighing 2½ lb., by which the weight can be varied from 17½ to 30 lb. A three-heat temperature regulation is provided. Both ends being pointed, the iron can be operated in either direction. The cord enters at the center and is so attached that it will not hinder the movements of the worker. A lifting device permits the iron to be raised easily.





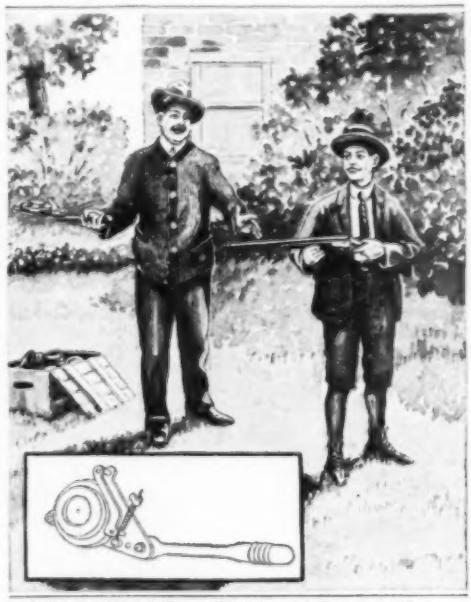
Walls Built to Protect Shade Trees When the Grade of the Adjacent Road was Raised

WALLS PROTECT TREES FROM DIRT FILLING

To preserve a number of large shade trees that lined a certain roadway, the grade of which was about to be raised, the New York Central Railway devised a novel means of protecting the trunks of the trees from the earth which the higher grade would naturally have thrown about them. As is well known, any considerable amount of dirt filled in around a tree will kill it. In this instance a wall of masonry was built around three sides of each tree and given a concrete coping. That portion of the wall next to the roadway was the highest and the other two sides slanted down from it to the former ground level at the same angle as the slope of the dirt that had been used in the fill.

HAND THROWER FOR TRAP SHOOTING

Target shooting which has more than the ordinary variety and interest in it can be enjoyed by the use of a small hand trap that has been brought out by an Ohio firm. The device is very compact, weighing but 10 oz.; attached to the spring mechanism, which throws a blue rock, is a short wooden handle by which it is manipulated. One person with this thrower and a bag of targets is able to throw them in a number of different ways, including many difficult flights, thereby furnishing very interesting sport for one or more marksmen. The trap will hurl the targets from 30 to 70 yards.



A Light Hand Trap Which will Throw a Target from 30 to 70 Yards

SOME NOVEL AND LITTLE KNOWN ACCESSORIES

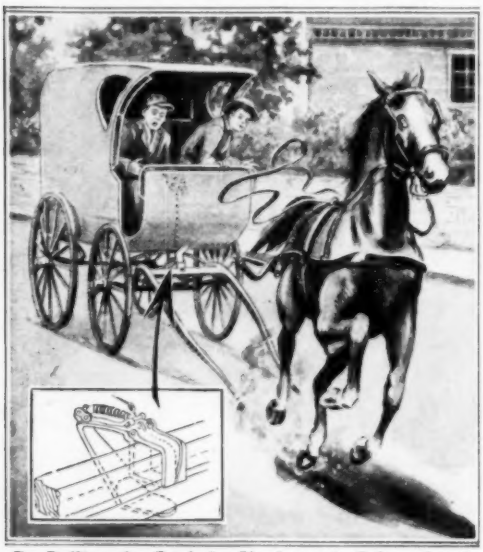
Right: Insulated Cabinet Which Keeps Milk Clean and Sweet
Grooved Molding for Portière and Curtains, Shown Also in Section. Right: Carrier for Curtain
Bathroom Mirror Illuminated from Both Sides and Fitted with Towel Bar and Soap and Mug Holders
Ostrich-Feather Opera Bag Which Comes in All the Evening Shades
Butter Carton Has Slits into Which Knife is Inserted to Push Cake Forward for Slicing
Instrument for Cutting Decorative Edges on Citrus Fruits
Crêpe-de-Chine Hat Protector for Women Motorists: Adjustable to Any Size Hat
Hose Reel Which Revolves on a Special Faucet; Hose Pulls Off in Any Direction
Kitchen Cabinet with Refrigerator Base
Fireproof Paper Drips Catch Grease from Candles
Electric-Light Plug with Six Fuses
Rocking-Chair Runners Adjustable to Any Pitch
Ice Box Which Hangs on the Wall: 26 Inches Wide, 22 Inches High, and 13 Inches Deep; Holds 25 Pounds of Ice

INTENDED FOR THE HOME AND ITS MEMBERS

Stopper Which Holds Cork Securely in Bottle by Wedge Effect
Filter for a Drop Light: Diffuses the Light in All Directions Evenly
Inconspicuous Eye Shield, Colorless and without Binding; Folds Compactly
Below, at Left: Can Opener with Two Sizes of Blades: One Downward Thrust Opens the Can
Chair Runner with Furniture Buffer for Protecting Walls
Sanitary Holder for Loaf Sugar: Loaves Released at Bottom
Safety Razor Which Winds Up: On Pressing a Button the Blade Revolves. Shaves with a Circular Motion
Oil-Stove Reservoir of Glass with Metal Protector and Handle for Lifting
Double-Decked Potato Masher a Simple Time Saver
Folding Paper Bucket for Motorists, Picnickers, and Campers
Milk Tester: Lower Ball will Float in Cream, but Sink in Milk; Top Ball will Float in Standard-Grade Milk
New Type of Serving Device with Cup Stands for Four People
Broiler Plate for Gas Ranges Rests on Feet and Permits Broiling over the Flame

WHIPPLETREE CLAMP FREES FRIGHTENED HORSE

For the benefit of poor and mediocre drivers of spirited horses, a Canadian



By Pulling the Cord the Singletree is Released and the Horse Freed from the Buggy

inventor has developed a device which permits the occupant of a buggy to release a frightened animal in case he loses control of it. The contrivance consists of a clamp which is bolted to the crossbar of the shafts and holds the whippletree. This is gripped rigidly by a spring-locked arm of the releaser. The latter is mounted so that it swivels and allows the singletree to oscillate properly. A cord attached to lever handles, with which the device may be locked or unlocked, extends to the dash. In case of necessity the horse may be freed from the buggy by pulling upon this cord. The action causes the arm gripping the whippletree to be raised, thus releasing it from the crossbar. The horse is so harnessed that the straps slip over the ends of the shafts as it jumps out of them, carrying all of the harness and the singletree.

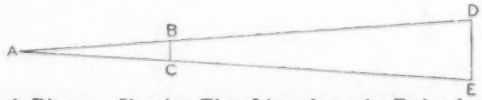
¶Waxed dress goods are the rage in Paris. The stiff, flaring silks, voiles, mohair mixtures, and woolens are being used almost exclusively.

APPARENT DIAMETER OF SUN AND ITS EXPLANATION

Many persons give differing replies when asked how large the sun appears to them to be, some comparing it with the size of a penny and others with that of a wagon wheel, or an object of less diameter. The majority of persons, however, seem to agree that when the sun is above the horizon it appears to be about a foot in width.

An explanation for this general answer may be found by studying the muscular adjustments made by a normal eye. In looking at objects within close range, the crystalline lens of the eye is thickened, while in viewing something in the distance, it is flattened. When an object about 110 ft. away from an observer is viewed, however, no muscular adjustment is required for clear vision, since the lens in its position of rest focuses the image clearly on the retina. Therefore one unconsciously estimates the size of a distant object by comparing it with the apparent size of some known object 110 ft. from him.

The sun is approximately 800,000 miles in diameter and about 93,000,000 miles distant from the earth. By a simple geometric calculation it may be proved that almost the same angle is formed at the eye in looking at the sun as is made when a foot rule 110 ft. away is sighted. The accompanying figure serves to illustrate this. The point A represents the eye; the line BC, a foot rule 110 ft. distant, and DE, the diameter of the sun. The distance AB is $\frac{1}{48}$ mile; AD, 93,000,000 miles; BC, $\frac{1}{5,280}$ mile, and DE, 800,000 miles.



A Diagram Showing That Lines from the Ends of a Foot Rule, BC, When Placed 110 Feet Away, Make the Same Angle at the Eye as do Lines from a Diameter, DE, of the Sun, 93,000,000 Miles Away

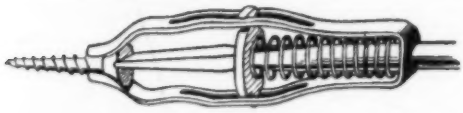
Therefore, $\frac{1}{48}$: 93,000,000 :: $\frac{1}{5,280}$: 800,000.

This proportion is not exactly correct, because the product of the means

is somewhat greater than that of the extremes. The result is close enough, however, to show that the sun does actually appear to be about a foot in diameter, because it makes at the eye approximately the same angle as that made by a foot rule at a distance rendering an adjustment of the eye unnecessary for clear vision.

SCREW IS CLASPED BY TOOL WHILE BEING TURNED

What appears to be a really serviceable tool for certain kinds of work is represented in a new screwdriver which is provided with a spring-clasp attachment that holds a screw firmly when it is being set or removed. It is so designed that it will fit a head of almost any size or type. Because of this, the operation of placing a screw in an out-of-the-way cramped place, inaccessible to one's fingers, is materially simplified. It removes the chance of dropping the screw into delicate parts of a machine and likewise allows one to work with quickness and assurance.



This Shows the Clasp Holding the Head of a Screw so That It may be Set in a Difficult Place without Trouble

The clasp has two groove-shaped prongs which grasp the head of a screw, and is brought into use when pushed forward by one's thumb.

FOLDING FIELD BED FOR WOUNDED SOLDIERS

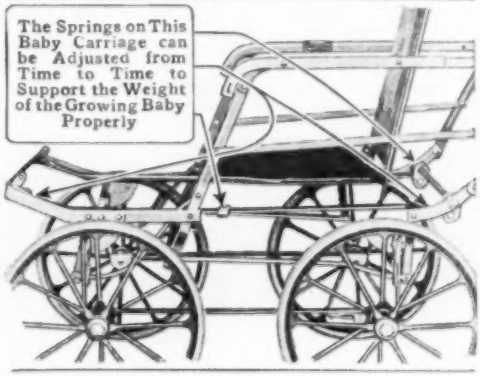
A field bed for wounded soldiers which can be folded into compact form has been designed by a German staff surgeon. Its framework consists of two A-shaped end supports with one brace connecting the apexes of the end supports and two braces fastened about the height of a bed. At the head are two crosspieces and two short braces which help to make the framework rigid and serve to hold the end of the mattress in a raised position.

A Compact Folding Field Bed for Wounded Soldiers

The body of the mattress rests on cotton belts. Slidably fastened to the ridge piece are several loops which can be used in supporting a patient's limb or other portion of his body. These can be adjusted as desired.

SPRINGS OF BABY CARRIAGE ADJUSTABLE TO LOAD

A baby carriage with adjustable springs has been placed on the market. This is a carriage in which a baby of a few months or weeks can ride easily because of the moderate resilience of its springs. As the baby gains in weight and stronger springs are needed to make the vehicle ride properly, these



The Springs on This Baby Carriage can be Adjusted from Time to Time to Support the Weight of the Growing Baby Properly

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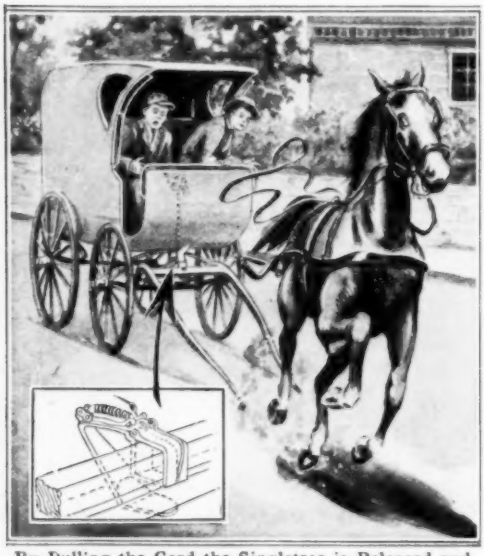

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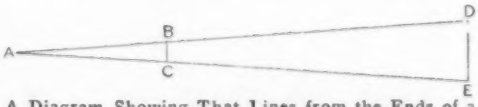

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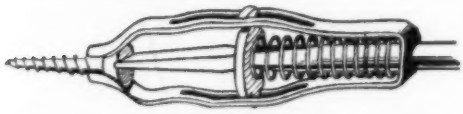

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The clasp has two groove-shaped prongs which grasp the head of a screw, and is brought into use when pushed forward by one's thumb.

FOLDING FIELD BED FOR WOUNDED SOLDIERS

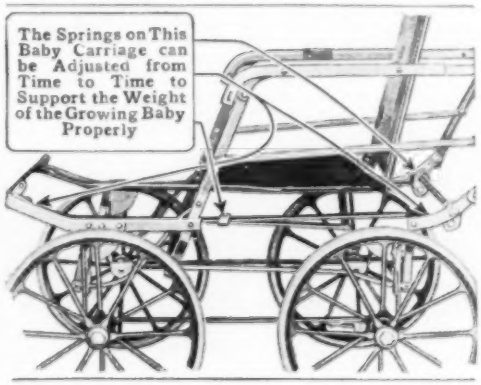
A field bed for wounded soldiers which can be folded into compact form has been designed by a German staff surgeon. Its framework consists of two A-shaped end supports with one brace connecting the apexes of the end supports and two braces fastened about the height of a bed. At the head are two crosspieces and two short braces which help to make the framework rigid and serve to hold the end of the mattress in a raised position.

A Compact Folding Field Bed for Wounded Soldiers

The body of the mattress rests on cotton belts. Slidably fastened to the ridge piece are several loops which can be used in supporting a patient's limb or other portion of his body. These can be adjusted as desired.

SPRINGS OF BABY CARRIAGE ADJUSTABLE TO LOAD

A baby carriage with adjustable springs has been placed on the market. This is a carriage in which a baby of a few months or weeks can ride easily because of the moderate resilience of its springs. As the baby gains in weight and stronger springs are needed to make the vehicle ride properly, these

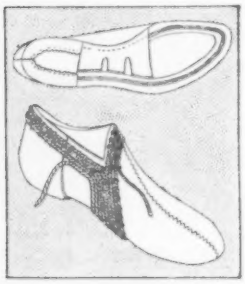


The Springs on This Baby Carriage can be Adjusted from Time to Time to Support the Weight of the Growing Baby Properly

springs can be stiffened by turning a simple adjustment under the body of the carriage. This carriage has the added advantage of being collapsible.

IMPROVEMENTS IN SHOES ADD TO FOOT COMFORT

Two inventions recently patented are intended to lessen the discomforts of breaking in new shoes. One type relates particularly to the heavier kinds of footwear. Owing to certain notches cut in the inner leathers of the sole, together with minor modifications in general design, the new shoe is capable of readily adjusting itself to the shape of the wearer's foot. The sole may shift to the right or left of the heel just enough to accommodate any peculiar curves or sore places that may be present. In this way pinching and other discomforts of a new pair of shoes are largely avoided.



The other invention applies more particularly to slippers. Using a peculiar method of winding, the entire slipper is covered with heavy cord, and from only one piece at that. Beginning at the crown, or tip, of the upper, one end of the cord is wound about a cloth form toward the toe, while the opposite end winds backward to the heel. Appropriate stitching holds each layer in place. Use of cord as a covering material results in an exceptionally pliable and comfortable slipper. A sole and heel of stiffer material may be attached if desired.

¶ By applying a coat of aluminum paint to the inside of a boiler the formation of scale is prevented. At a session of the French Academy of Sciences it was announced recently that aluminum in the form of flour, rather than coarse powder, is preferable for this purpose.

ELECTRICALLY OPERATED COAL-HANDLING PLANT

An electric coal loader, the dipper for which runs under a steel framework, 75 ft. high and 200 ft. long, is employed by a railway in the state of Washington as a part of the equipment of a yard in which as much as 80,000 tons of coal are stored for emergency use and for locomotives. The dipper has a capacity of 2 tons, is operated by a 135-hp. motor, and can make a round trip in one minute. The capacity of the hopper is 30 tons. Two engines can be loaded at one time, one by gravity and the other by a steel-belt conveyor, power being furnished by a 10-hp. motor. Ten tons of coal can be loaded on a tender in four minutes. Two 15-hp. motors move the structure along tracks from one end of the coal pile to the other. One man only is needed to operate the motors.

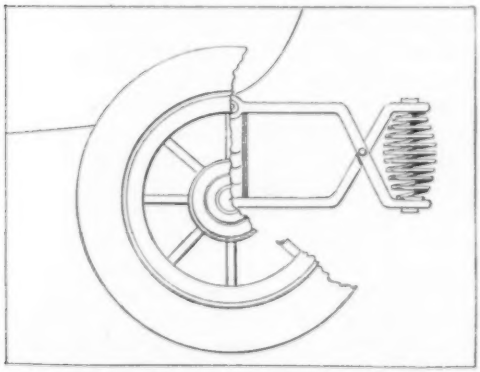
The Steel Framework of This Electrically Operated Coal-Handling Plant Is 75 Feet High and 200 Feet Long: The Dipper can Make a Round Trip in One Minute

PACIFIC COAST STAGE LINE USES MANY MOTOR CARS

One of the most pretentious revivals of stage transportation in this country is the automobile stage line which is now maintained between San Francisco and Los Angeles, a distance of more than 400 miles. Every morning eight machines leave from the northern terminus and the same number from the southern end of the route. On the journey southward the first stop is at Gilroy for luncheon. At Fresno the passengers are put up for the night; on the second day luncheon is served at Bakersfield and the travelers reach the end of their journey in the evening. At present 32 seven-passenger touring cars are operating on this line.

SHOCK ABSORBER RESEMBLES TONGS IN ACTION

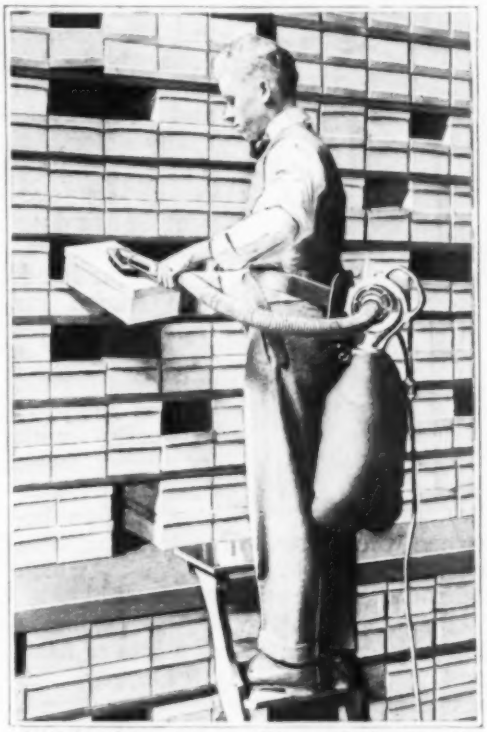
A tonglike shock absorber lately patented is intended to supplement the regular springs on heavy cars, or to act alone as the sole source of resiliency on cars of lighter weight. The long ends of the tongs attach one to the body of the car, and the other to the axle housing. A heavy coil spring separates the opposite ends, supplying necessary elasticity. The pin on which the two arms pivot is supplied with a heavy bushing, to have better wearing qualities, and ball bearings between the arms eliminate squeaking and friction.



Tonglike Shock Absorber Supplements or Takes Place of Other Types of Automobile Springs

VACUUM CLEANER HANGS FROM USER'S BELT

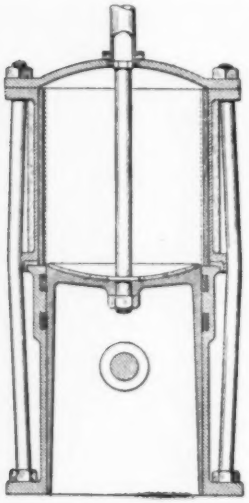
A vacuum cleaner which is designed especially for store use has recently been put on the market. The distinctive feature of this article is that it can be suspended from the belt of the worker and carried to any part of the room within the radius of the electric-wire connection. It weighs only 7½ lb., and so is not at all cumbersome. A special swivel joint connects the hose with the cleaner so that the former can be turned about in various directions without accidentally shutting off the suction. A number of attachments go with this machine for use in cleaning boxes, cloth-covered surfaces, including upholstered furniture and billiard tables, clothing, curtains, and books. The frame of the cleaner is aluminum; the dust sucked up through the hose is blown into a cloth dust bag of special fabric.



A Light-Weight Vacuum Cleaner Designed to be Attached to the Operator's Belt While Shelves, Books, and the Like, are being Cleaned

EXPLOSION MOTOR OPERATES WITH RED-HOT CYLINDERS

If for any cause the cooling system on an ordinary automobile or similar engine should fail, the machine promptly begins running hard and will eventually stop, if emergency means for preventing undue temperature rise are not at hand. The reason for the stopping lies in the fact that cylinders and pistons expand unequally with increasing heat, causing excessive friction between the parts. Besides, the heat destroys the lubricating oils which keep the engine running smoothly.

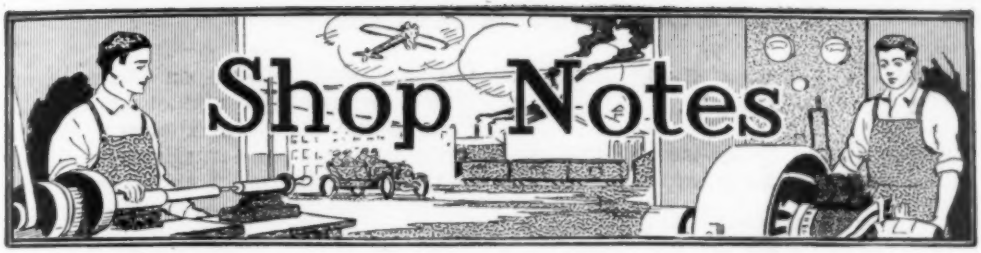


But the cooling of an explosion engine's cylinder causes a loss of heat, and a consequent loss of energy. A statement has been made that, from a theoretical standpoint at least, an explosion motor would reach maximum efficiency if it could be run with its cylinder at red heat. Proceeding on this idea, a French engineer has invented a motor to be operated at such high temperatures.

The cylinder on this engine is built in two parts. The lower one resembles an ordinary cylinder, with the exception that its upper end has two grooves in which compression rings are fitted, these being a part of the cylinder, and not of the piston as in American engines. The upper, or explosion part of the cylinder, is covered heavily with asbestos, which covering therefore supplants the cooling chamber ordinarily so situated on an engine. Moreover, the upper surface of the piston is also covered with asbestos, and the two halves of the cylinder are separated by an asbestos ring. The result is that but little heat can escape from the upper cylinder. The piston does not rub against this part of the cylinder, a little clearance being provided to avoid binding. The inner walls of this upper part are, in addition, made of solid nickel, which is more heat-resisting than steel. Since the rings in the lower part of the cylinder are the only things which would ordinarily guide the piston, an additional steering device is provided in a piston rod which runs up through the top of the cylinder.

ADDED COST OF LAMPBLACK DUE TO WAR AND DEMAND

There are several factors which are responsible for the increased price of lampblack, the most important of which is the cessation of all imports of creosote oil, from which the material is made. In the past this trade has amounted to more than 100,000,000 gal. yearly. In addition to this, the demand for the material has developed greatly since the opening of hostilities abroad, due to the increased volume of business with South America and other foreign countries which heretofore have purchased the bulk of their finished products from European markets. The dye shortage has likewise had its effect upon the situation, for manufacturers who before the war used anilines have been compelled to revert to the older staple blacks. In case Germany recovers her foreign markets at the conclusion of the war, it is considered that the motor car will be the chief remaining thing that will tend indirectly to keep up the cost of lampblack. The use of power-driven vehicles is promoting good roads, and many of these are both built and maintained with a binder consisting of a mixture of pitch and oils. It is not thought that the increased production of tar will be sufficient to offset this extra demand. There are other new and growing sources of demand for creosote oil, but so far it is not thought that these will exert any marked influence upon the market.



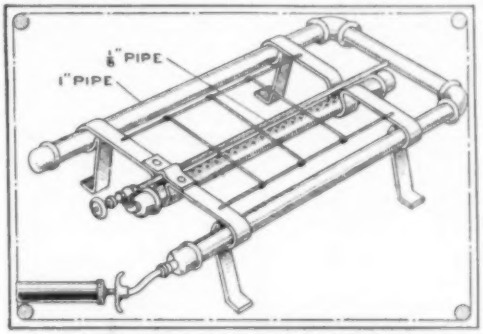
Gasoline Camp Stove

By R. S. MATZEN

AT the suggestion of an automobile owner, who is fond of jaunts into the woods and of fishing excursions, I devised the camp stove shown in the sketch. It is entirely self-contained, and may be filled with sufficient gasoline to provide a cooking fire for a considerable time. Its compact form and general usefulness was appreciated, and I have made several for persons who saw the original one in use. The large outer pipe is filled with fuel by removing the cap at the left. The pump on the opposite end provides pressure to force the vaporized gasoline from the burner at the center. The small valve is used to control the supply of fuel.

The stove is constructed as follows: Cut two pieces of 1-in. gas pipe, 14 in. long, for the sidepieces, and a 5-in. piece for the back end. Thread them, fit them with end caps and join the pipes in the U-shape shown, with elbows at the back corners. Tap the cap at the right for a bicycle-tire valve and fit the latter into place. A bicycle pump attached to it provides the pressure for the gasoline tank. Tap the back section of pipe for a ⅛-in. copper pipe, at the other end of which a valve is fitted. This completes the gasoline container from which the fuel is carried to the burner.

To make the burner, drill three rows of holes in the upper part of a piece of 1-in. pipe, 12 in. long, as shown in the illustration. The rows are ⅜ in. apart, and the holes, of 1/32-in. diameter, are also spaced ⅜ in. apart. Countersink each hole slightly with a ⅛-in. drill. Make two clamps, as shown, to hold the burner and the copper tube in the center of the tank. Plug the back end of the burner, and fit the other end with a cap, tapped to fit the valve with an elbow. Make a grate of heavy wire



This Gasoline Camp Stove Is Compact and Self-Contained: The Fuel is Placed in the Outer Pipe and Kept under Pressure by the Pump

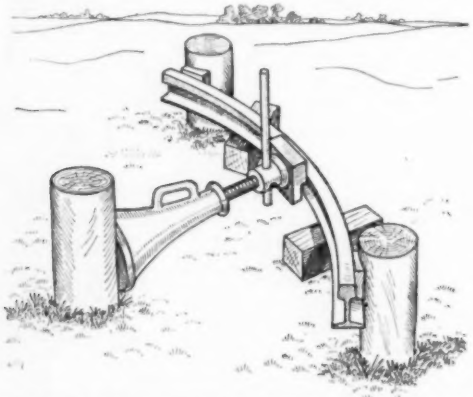
and fix it into the straps as shown. This completes the construction, and when the outer pipe, or tank, has been filled with fuel, pressure may be provided with the hand pump. The copper tube must be heated until the gasoline vaporizes. Then light the burner. The flame from the center row of holes keeps the generator tube hot, and the other holes provide for the heating of utensils.

Rigid Shear Made of Snips

Experiencing some difficulty in cutting a sheet of metal, I fixed one handle of an ordinary pair of snips in a vise, leaving the upper handle free. In this manner a powerful pressure was obtained by the use of one hand and the weight of the body thrown against it. The other hand was left free to hold the metal.—Contributed by W. W. Flanders, Everett, Wash.

Simple Method of Bending Rails or Bars

An ordinary jackscrew, arranged with three posts sunk into the ground,

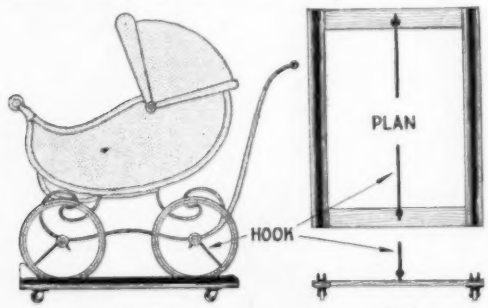


The Lifting Jack may be Used to Bend Bars or Rails by Rigging It between Posts Sunk into the Ground

may be used to bend heavy bars or rails, as shown in the illustration. The stakes must be heavy and set deep enough to stand the pressure. If necessary they may be braced. The bar, or rail, is set on blocks to make it level, and smaller blocks are fitted between it and the posts. The top of the jack is provided with a suitable block, to prevent slipping and to distribute the pressure evenly.

Truck for Baby Cab Indoors

A baby cab is usually convenient in which to place a child in order to have



The Truck Prevents the Soiling of the Floors by Dirt on the Carriage Wheels After Baby has been Given an Airing

it near its mother, who must work in various parts of the house. But after the carriage had been on the walk or street, we found it almost impossible to keep the wheels clean enough, and the result was that tracks marred the floors of our home. I constructed the carriage truck shown in the sketch, and the difficulty was remedied completely.

Now, on entering the house, the carriage is rolled on the truck, the brake is set, and the hooks at the front and back axles are put into place. The revolving casters make it possible to move the carriage more easily than on the wheels. The device was constructed of ⅞-in. strips. Those for the end and sidepieces are 2½ in. wide, and the small strips which guide the wheels are ¾ in. wide. Small channels of metal may be substituted for the wooden strips, as indicated in the end views.—Contributed by Charles P. Wiweke, Albany, N. Y.

Block Protects Sawyer's Hands from Splinters

Operators of cut-off saws, or other machinery on which rough wood is handled, will find a block fitted with a number of sharp steel points convenient in preventing splinters from entering the hands. In addition to the pain and annoyance of troublesome bits of wood which lodge in the flesh, there is the danger of infection. Such a block should be made to fit the hand, and a size of 2 by 3½ by 6 in. will be found convenient. The steel points on one of the flat faces grip the lumber to be handled and the sawyer need not touch it with the hands except when the stock is to be lifted.

Making Smooth Castings in Babbitt Metal

Smooth castings may be made in babbitt metal if the following suggestions are observed: In constructing a wooden mold, permit the grain of the wood to run parallel with the pouring gate. The bottom of the mold should be "built up" out of the ends of boards, so that the grain runs at right angles to the surface of the bottom. This as-

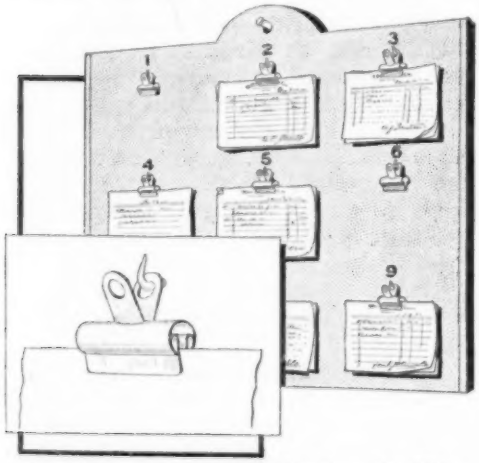
sists in venting the mold and prevents bubble holes. If the bottom is too large or difficult to construct in this fashion, use a sheet of dry blotting paper backed with wood. Cardboard and blotting paper are useful in constructing irregular parts of molds.

Dry the mold in an oven before casting. Place it in a box and pack sand around it to prevent leakage. Before pouring the metal into the mold, test the former by thrusting a wooden splinter into it, at intervals of a few seconds. When boiling and sputtering cease, it is ready to be poured. The straight edge of a piece of glass is an excellent instrument for finishing flat surfaces of babbitt metal.

Clip Board for Shop Orders

Each foreman's office in the repair and maintenance departments of a large manufacturing company is provided with a board for shop orders, as shown in the illustration. The board is studded with shoulder hooks numbered to correspond to the workmen, and orders for the men are placed in spring clips hung on the hooks.

The foreman arranges the orders in each clip as they are to be performed.



The Workmen Take Their Orders from the Clips Even in the Absence of a Foreman

If in the absence of the foreman a job is completed, the workman refers to his clip for another job.

Making a Waterfall for the Movies

Motion-picture operators devised an artificial waterfall over a dam in a landscape background for a scene, as shown

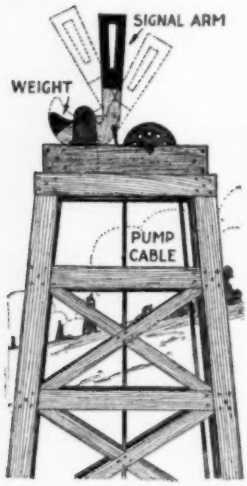
The Cameras were Set and at a Signal the Water was Released, Producing a Picturesque Waterfall

in the sketch, when weather conditions prevented a normal flow of water over the dam. The pond was small, the dam being only 50 ft. long, and the feeding streams were reduced to trickling rivulets.

Boards, set edgewise, were fitted to the planking on the inside of the dam, increasing its height 8 in. These boards were left in place and the water accumulated behind them in the pond. They were arranged to be pulled away quickly with wires run to the bank, as shown in the illustration. With cameras set, the boards were withdrawn. A waterfall the full length of the dam was produced and proved suitable for the desired purpose during a period of 10 minutes. This simple expedient averted a considerable loss and made results possible in spite of the perversities of the weather.—Contributed by Donald A. Hampson.

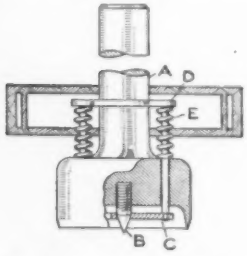
Oil-Well Pump Signal

The signal device to be fixed at the top of an oil-well pump frame, as shown in the sketch, was devised by a well owner in Oklahoma and proved easily worth the effort of making it. The signal is attached to a cord fixed to the pump cable, and "wigwags" when the pump is in operation. The caretaker can thus see from a distance whether or not a well needs attention. —Contributed by Ray Colburn, Perry, Oklahoma.



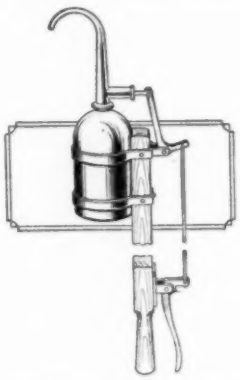
Punch for Making Fiber Washers

The punch illustrated was designed for the cutting of washers out of sheets of fiber, 1/32 in. thick. It is provided with springs which thrust the washer out when it is cut. The body of the punch A is counterbored in the lower face, and a sharp cutting edge is ground along the rim. The point B is threaded into the body, and extends slightly beyond the cutting edge. The spring device, at the lower end of which is a washer, C, operates in two holes drilled through the wider portion of the body. The washers C and D are riveted to the ends of the pins E, after the springs are inserted. The fiber is cut by placing the point B over the center of the desired disk and striking the shank of the punch with a hammer, or mallet. The cut washer is removed by pressing on the upper washer D. The center holes of the washers may be cut by a punch of suitable size. The body is made of tool steel, and drawn to a suitable temper at the cutting edge.—Contributed by C. H. Anderson, Worcester, Mass.



Safety-First Shaft Oiler

Accidents are not infrequent in shops from carelessness in oiling overhead shafting and machinery. Until recently this work was done in a large automobile plant by an oiler who carried a long ladder about the shop, with which to climb up among the whirling belts and pulleys. He not only endangered himself while at work, but the ladder was a nuisance to his fellow workers. By the use of the oiler shown in the sketch, the danger was removed, and it was seldom necessary to climb a ladder to reach the overhead machinery.



An oilcan of the force-pump variety was fitted to the end of a pole with straps, as illustrated. Its spout was lengthened and turned down at the front. A set of levers, controlled by a handle on the lower end of the rod, was attached. By shifting the lever handle, the pump is operated and oil forced from the can to the bearings overhead. —Contributed by J. S. Hagans, Toledo, Ohio.

An Emergency Funnel

If a funnel is needed for the pouring of gasoline into an automobile, or other motor vehicle, a glass bottle broken off near the bottom will provide a satisfactory substitute. Such a makeshift has saved tourists from inconvenience on several occasions. — Contributed by Calixte LeBeuf, Jr., West Mount, Quebec, Canada.

A GARDEN FOUNTAIN AND BASIN OF CONCRETE

by Herman E. Nichols.

A SIMPLE home garden may be lifted out of the commonplace and given something of the atmosphere associated with the large estate or country place by the addition of a small fountain, in keeping with the surroundings. Spraying water and a glistening pool lend a charm to the home grounds, of which the householder may well avail himself, since the expense is comparatively inconsiderable, and the work may be undertaken, for the larger part, by the novice. A fountain and basin, designed with these considerations in mind, is shown in the illustrations, in actual use. It was constructed at a cost of $10 for materials and labor not performed by the owner.

Concrete is a substantial and economical material from which to construct a fountain, and has the added advantage that it may be handled with reasonable success by a careful person not specially skilled. It has possibilities of adaptation to a great variety of designs and methods of construction. This is a desirable feature, since many persons may wish to adapt the design shown to their own needs or artistic and constructive skill. The circle, square, diamond, oval, octagon, or more complicated figures, may be taken as the basis for a design, and "pick-up" materials about the home may be used to develop the forms for the concrete.

No attempt was made to finish the surfaces of the fountain, as the rough-cast effect is satisfactory and harmonizes well with the simple, substantial lines and construction. Other finishes, with inset designs, panels, etc., may be made to accord with the design and decoration of the home, or the formality of the garden.

A water supply is, of course, essential, but this should not offer serious obstacles, though it is a phase of the construction that had better be handled by a mechanic. A city water supply offers a ready solution. A spring with sufficient pressure to throw the water two feet above the upper surface of the fountain is also satisfactory. Where the fountain is to be connected with a private water-supply system, it is desirable to provide a tank set high enough to give the fountain-spray pressure. The quantity of water necessary for the fountain described is less than that used by the average lawn sprinkler, and like the latter, it may be turned on and off, or the size of the flow regulated, as desired. The water in the reservoir may in some instances be used for other purposes, such as watering flower beds or the garden. If the garden is protected, small fish may be kept in the reservoir.

The fountain, as shown in the illustration, consists of two main parts, the reservoir below and the dished bird basin, from the center of which the spray flows. The design is based on the octagon, the layout of which is shown in the small ground plan and elevation at the top. The details of the water supply, the casting and finishing

of the reservoir, and the making of the basin are shown below in the sectional diagram and the sketch.

The water-supply pipes and the drain to remove the excess water from the reservoir should be provided and fitted into place before the construction of the fountain proper is begun. The supply pipe should be ½ in., and the outlet pipe ¾ in. The outlet pipe should extend to within an inch of the upper edge of the reservoir. It should be turned from time to time while the concrete is setting, in order that it may be removed when it is desired to drain the reservoir for cleaning or for the winter.

When the pipes are arranged, the foundation of grouting, B, may be laid. Care must be taken that the supply pipe is centered properly. The grouting should be about 10 in. in depth, and of a mixture of one part cement, three parts sand, and six parts gravel, or crushed rock. In order to make the foundation of the same shape and only slightly wider than the main portion of the fountain, it is desirable to make the frame for the outer faces of the reservoir, as shown in the ground plan and elevation, before laying the foundation. The frame may then be used as a guide, although the octagon may be laid out on level ground, and by careful digging, the sides of the hole may be used, without boards, as the foundation limits.

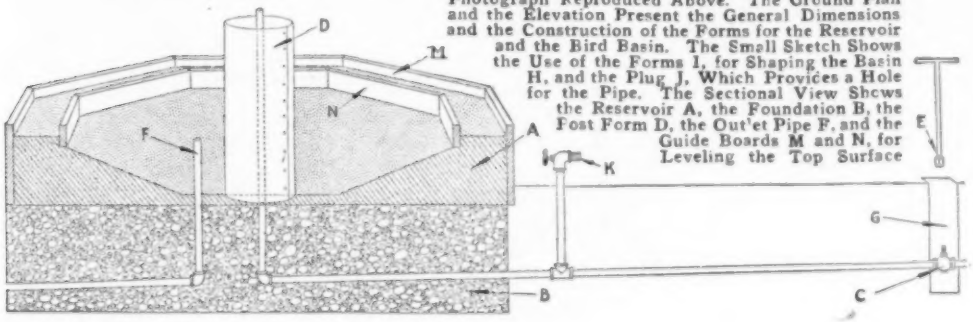
The form for the reservoir should be made very carefully, as upon its accuracy will depend the symmetry of the fountain. First make a frame of 6-in. boards, inclosing a 4-ft. square, as shown in the ground plan. At the middle of each of the sides lay off a distance of 20 in., centering it, and making the measurements on the inner sides of the frame. Fit pieces into the corners, having braced the square frame against being forced out of shape. Make three pieces of 1½-in. strips to form a mold for the inner octagon. The pieces are 16⅔ in. long on the outer surface, and should be mitered carefully, and nailed at the joints. To hold the form in its proper shape, place it inside of the outer form, and set it to provide a space of 4 in. between them. Nail braces to the inner form, and when using the latter, separate it from the outer form the necessary distance with braces, and level its upper edge with that of the outer form.

Fix the outer form into place on the foundation. A mixture of one part cement to three parts of sand is used in all of the remaining concrete construction. Pour in the mixture, tamping it down, and shape the material roughly to the cross section shown in the sectional view. The thin part of the reservoir near the middle is 1½ in. thick. When the concrete has been heaped up sufficiently at the sides, set the three-section inner mold into place, and level off the upper surface of the sides, on the outer and inner molds, as at MN. Transfer the inner mold and complete the rim all around the reservoir. Smooth off the interior, sloping it evenly and making the floor flat. It is important that the outlet pipe be turned repeatedly at this stage so that it will be removable when the concrete is dry. The forms may be left in place temporarily as a protection.

The support for the bird basin may be poured next. Form a sheet of galvanized iron into a cylinder with an inside diameter of 6 in. and a height of 15 in. Set this over the center of the reservoir and pour the concrete into it, leveling the mixture off at the top of the cylinder. The supply pipe should be plugged during these operations in order to prevent particles from clogging it.

The bird basin should be made on a board table, as shown in the small sketch above the sectional view. It may be made by fixing the 3-in. pieces I, making up the form, to the table, or by building up a form similar to the outer form for the reservoir, as shown in the ground plan. The latter method is preferable, particularly for the novice. Pour the concrete into the form and smooth off the upper surface even with the upper edges of the mold. Form the dish in the top, 1 in. deep, with a trowel. The center hole,

The Effectiveness of This Inexpensive Fountain for the Home Garden is Brought Out Strikingly in the Photograph Reproduced Above. The Ground Plan and the Elevation Present the General Dimensions and the Construction of the Forms for the Reservoir and the Bird Basin. The Small Sketch Shows the Use of the Forms I, for Shaping the Basin H, and the Plug J, Which Provides a Hole for the Pipe. The Sectional View Shows the Reservoir A, the Foundation B, the Post Form D, the Out'et Pipe F, and the Guide Boards M and N, for Leveling the Top Surface



through which the supply pipe is to fit, should be provided for by inserting a wooden plug, or a short section of pipe of proper diameter, into the center of the mold, and turning it while the concrete is setting. When the proper time for drying has been allowed, the bird basin may be set into place and the molds removed. Rough corners or leakage roughnesses may be cut away.

It may be noted in the sectional view that the supply pipe was provided with a stopcock, C, set into a chamber, G, so that the water may be regulated with the wrench E. A tap extending from the supply pipe may be used to supply water to a garden hose, at K.

The material and other costs for this fountain as constructed were as follows: screened sand, ½ yd., 75 cents; two bags cement, $1; piping, $2.25; labor, $6. Gravel for the concrete used in the foundation was obtained without charge.

Rapid Method of Labeling Bottles

Bottles, or similar receptacles, may be labeled rapidly and easily by hand. The method as illustrated is as follows:

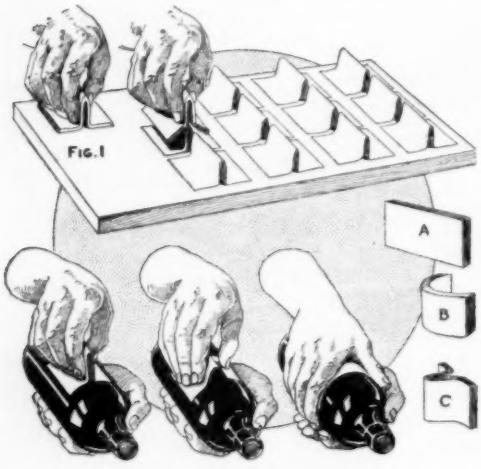


FIG. 3 FIG. 4 FIG. 5

Paste is Spread on the Stone, the Labels are Placed upon It, and Then Affixed to the Bottles

Fold the labels into the successive shapes shown at A, B, and C. Coat a piece of stone, or a sheet of heavy cardboard, with paste. Press a bunch of the bent labels upon the stone, as shown in Fig. 1. The lower label remains attached in the paste, when the bunch is lifted. Continue this operation rapidly until the stone is covered with labels. Pick up the labels one by one and affix them to the bottles in the manner shown in Figs. 3, 4, and 5.

This method is also cleanly, since the paste, instead of being squeezed out at the edges, is pushed toward the center of the label by the movement used in affixing it. Two persons working together may accomplish relatively better results, the one applying paste and labels to the stone, and the other affixing the labels.

A Remedy for Carburetor Back-Firing

Back-firing of a gasoline engine through the carburetor can be, in a great many cases, traced to the excess air. On many of the carburetors a wire screen is usually provided for the purpose of allowing this air to enter in the form of line streams, which aids greatly in making the proper kind of mixture. The screen also serves another important purpose in that it prevents dirt from entering the carburetor.

In place of using only one screen, apply three, and by shifting them radially with respect to one another, the splitting up of the air is easily accomplished, and also increased or decreased as conditions warrant. The device works well, and the mere shifting of one or two of the screens quickly eliminates some of the troublesome cases of back-firing.

Coil Spring to Reinforce Rubber Tube

A coiled spring placed around, or inside of, rubber tubing will prevent the latter from collapsing in experiments, or other processes, in which there is less than atmospheric pressure within the tube, or a pressure greater than atmospheric pressure when the outer reinforcing is used.

Mirror as a Shop Tool

In many instances when a flash light was not at hand I have found a mirror of considerable aid in doing mechanical work upon which the light of a window or other source does not fall directly. Light may be reflected, by the use of a small mirror, into telephone boxes, engine cylinders, and other places difficult of access without special lighting. The mirror may be mounted so as to pivot in several directions, and fixed upon a small stand. In this form, it is especially convenient and often permits the workman the use of both hands.—Contributed by Roy B. Snow, Juddhaven, Ont., Canada.

Nonblister Screwdriver Handle

Blistering of the palms of the hands after considerable use of a screwdriver is a common experience, as well as a painful one. After one such instance I devised the revolving end for my screwdriver handle, shown in the sketch, with the result that I worked for hours without causing blisters. The disk was attached with a screw, countersunk slightly. The device is satisfactory only on handles having a fair diameter, since a screw strong enough to hold well will leave only a narrow end surface on which the hand may rest. The joint between the handle and

The Disk on the End of the Handle Prevents Blistering of the Palm

the disk should be smooth and oiled.—Contributed by D. R. Van Horn, North Loup, Neb.

Lean-Back Swing of Wood-Faced Angle Iron

Durability and comfort are the features of the lean-back swing, for use on the porch or other open-air spot, shown in the sketch. Adjustable brackets at the sides, fitted with wing nuts, make it easy to set the back at various angles, and the swing is so constructed that the whole framework shifts to accommodate the angle of the back.

The frame is substantially built of riveted, or bolted, angle iron of 1-in. face. Wooden strips are used to face the metal frame, both for comfort and appearance. The smaller sketches

This Lean-Back Swing Is Substantial and Convenient for the Veranda, or Other Place Out of Doors. It is Built of Angle Iron Faced with Wooden Strips

above indicate the chief dimensions and the method of fixing the strips into place. The strips used for the footrest are $\frac{7}{8}$ by $1\frac{1}{4}$ in. and those in the back are $\frac{7}{8}$ by 2 in. Various sizes may be used for these strips, and the general dimensions of the swing may be altered to suit the individual needs. The bolts and rivets used were $\frac{5}{16}$ in. in diameter. Where a fixed joint was desired, it was riveted on the end so as to prevent the nut from becoming loose. Where loose joints are desired, it is best to fit the bolts with washers, and to place a second nut on the threads to act as a jam nut. The boards of the seat may be made of any convenient width, but it is best to set them apart slightly. — Contributed by Hubert Kann, Pittsburgh, Pa.

¶ A stick wedged into the slot will sometimes aid in starting machine screws.

Cable Clamp for Large-Conductor Terminations

By A. T. TALBOT

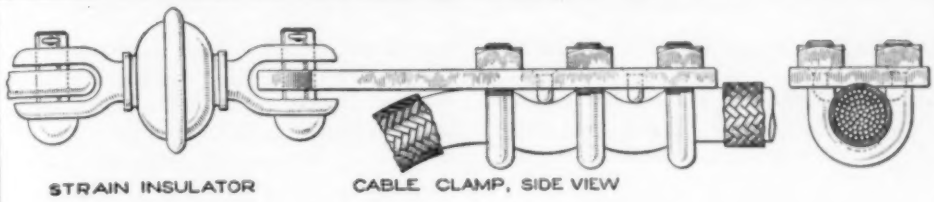
IT is not only difficult but uneconomical to "make up" heavy electrical conductors at termination points. By a termination point is meant a location where the conductor run ends or where it changes direction. If an endeavor is made to make up a large conductor on —twist it around—an insulator, considerable time is consumed in the operation, and furthermore, the copper that is wasted in making the short turns around the conductor represents a relatively considerable investment. This is particularly true when copper is quoted as high as 25 cents a pound. These end turns serve no purpose electrically, their function being merely to provide a mechanical attachment.

It is therefore usually considered good technical and economical practice to use a cable clamp, as suggested in the upper sketch, at such locations. The cable clamp, which is in electrical contact with the conductor, is insulated from adjacent members with a strain insulator, shown at the left. These strain insulators are usually of the type commonly applied in street-railway construction. Cable clamps of various designs may be made, or purchased in the open market. A clamp of the type illustrated, the details of construction of which are given in the following paragraphs, is cheap, effective, and readily made with reasonable shop facilities.

The upper sketch indicates how the conductor is fastened in the clamp by the binding section of the U-bolts. The end of the conductor at the right extends to an insulating support for the conductor run, while the other end may feed an energy-consuming device, connect to the terminals of a switch, or like appliance, or continue the run in a different direction, as shown in the lower sketch. The latter suggests the arrangement of a right-angle turn at the corner of a building in a heavy-conductor run. The conductors are held in the cable clamps. The strain insulators insulate them. Turnbuckles are provided so that the conductors may be drawn taut. The function of the tension rods, detailed in the small sketch, is to transmit the stress from the strain insulators to the turnbuckles. It is sometimes feasible to arrange a right-angle turn without using the tension rods, but as a rule their installation is justified because with them sharp bends in the conductor are eliminated, and furthermore, if they are used, the turnbuckles do not lie directly over one another. Where the turnbuckles are directly over one another, it may be difficult to turn them to adjust the tension. Eyebolts, inserted in holes drilled for them in the brick wall, support the entire arrangement. Cast-iron building washers should be used to distribute the pressure impressed by the bolts over an ample surface on the walls.

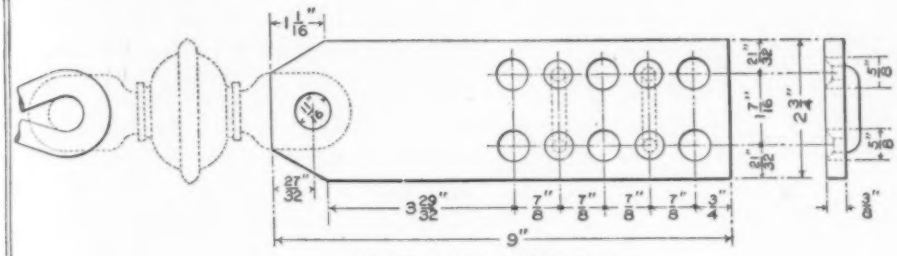
The diagram across the middle of the page shows a solution of a situation that is often encountered. That is, it is sometimes necessary to terminate conductors at a truss chord, or similar member, to provide for the insertion in the circuit of a cut-out, switch, or similar device. For such service an iron plate, having holes punched in it as suggested, may be bolted to the truss chord. The hooks of the turnbuckles may engage in holes provided for them in the plate. They may be procured with a hook at one end and an eye at the other, or with hooks or eyes at both ends.

The cable clamp proper consists of two parts, the plate and the U-bolts. The plate may be a piece of 2¾ by ⅜-in. strap iron, cut and drilled as indicated in the illustration. U-shaped pieces of ¼-in. round iron stock are riveted to the lower face of the plate to provide "humps," so that the conductor, when it is clamped in position, may be more effectively restrained. The U-bolts are pieces of ½-in. round iron stock, threaded at each end, provided with nuts, and bent into a U-shape, as detailed at the left of the lower sketch. They are shown clamping the cable, in the upper sketch.

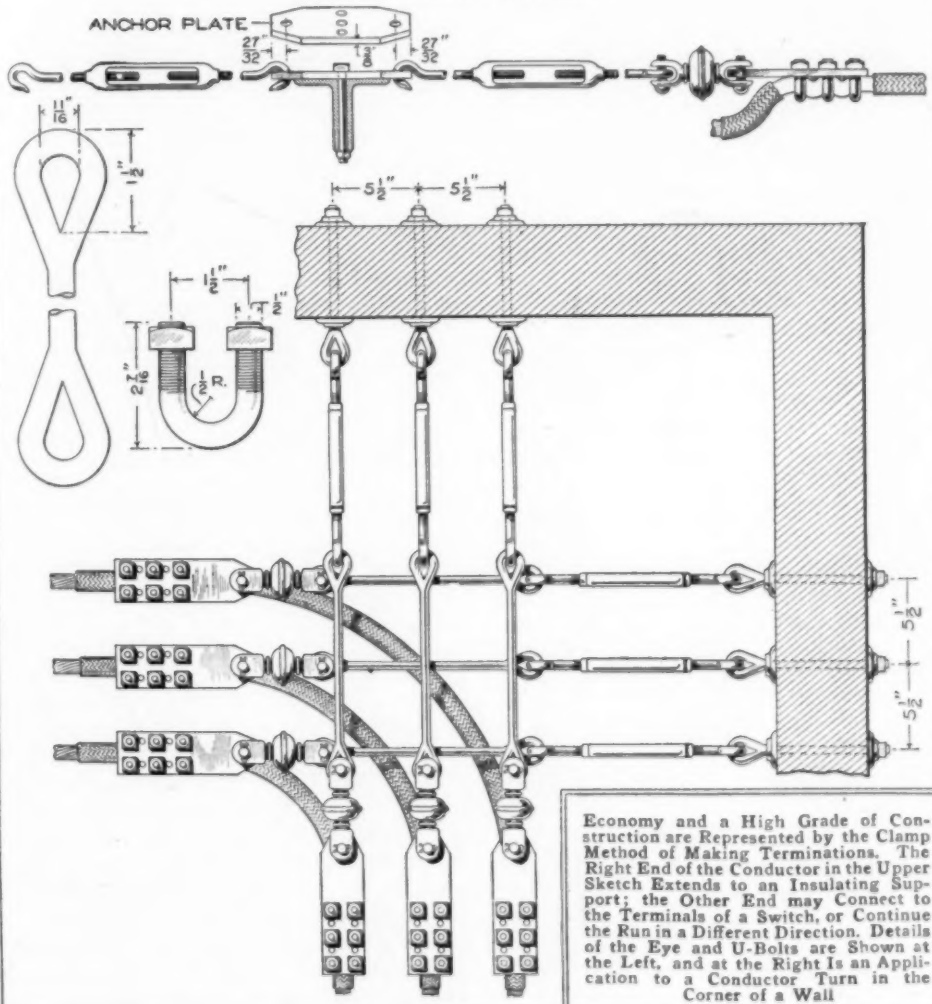


STRAIN INSULATOR

CABLE CLAMP, SIDE VIEW



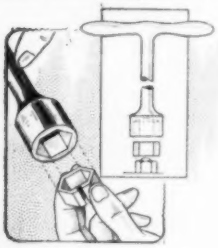
CABLE CLAMP, TOP VIEW



Economy and a High Grade of Construction are Represented by the Clamp Method of Making Terminations. The Right End of the Conductor in the Upper Sketch Extends to an Insulating Support; the Other End may Connect to the Terminals of a Switch, or Continue the Run in a Different Direction. Details of the Eye and U-Bolts are Shown at the Left, and at the Right Is an Application to a Conductor Turn in the Corner of a Wall

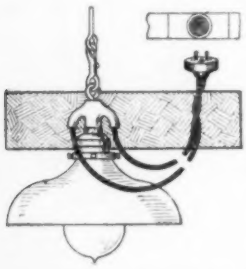
Reducing Size of Socket Wrench

Having broken a socket wrench of the size required to loosen a nut on an automobile and not knowing where I might obtain another, I devised a collar to fit into a wrench of larger size, as shown in the sketch. This method worked satisfactorily, and has been used to enable other wrenches to fit smaller-sized nuts.—Contributed by Percy L. Anderson, Wilmington, Del.



Detachable Lamp Hanging

In shops or factories where machinery or other large objects are frequently moved and electric-light fixtures are endangered in the process, the detachable lamp hanging shown in the sketch will prove of service. The ceiling sockets of the fixtures should all be of the same type so that the hangings may be interchangeable. The lights are supported from rods or chains and may be released by the use of snap buckles.

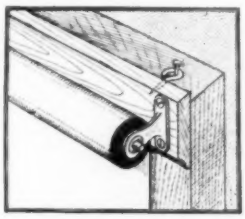


One-Piece Razor Handle

When a razor handle broke I found that it was easier to make the new handle out of a single piece of wood than to fashion the halves separately and fit them together. The holes near the ends were bored first, and the slot was then sawed out and smoothed. The pin at the end A is not only for finish, but also prevents the handle from splitting at that point. —Contributed by James M. Kane, Doylestown, Pa.

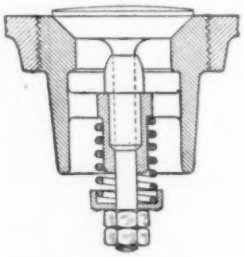
Holder for Curtain Fixture

To avoid defacing the window trim in fastening brackets for roller shades or curtains, the fixtures may be secured to a strip of wood, as shown in the sketch, and suspended on screw eyes hooked over nails. This method causes no marring of the woodwork and, if the strips are finished to harmonize with it, makes a satisfactory device. There is an added advantage in that the strips with shades attached to them may be removed easily for cleaning, or for transfer to another location.—Contributed by Charles Schapmeier, Baltimore, Md.



Repairing a Valve Cage

The automatic inlet valve on a motorcycle engine was not provided with a sufficient length of guide bearing. The constant shocks of the machine, together with the insufficient bearing length, caused the valve to vibrate laterally, and within a short time a poorly operated valve was the result. The illustration clearly shows the manner in which the trouble was eliminated. The repair consisted in merely inserting an additional bushing inside of the valve cage. The upper portion of the bushing was inserted as shown, a press fit being sufficient.



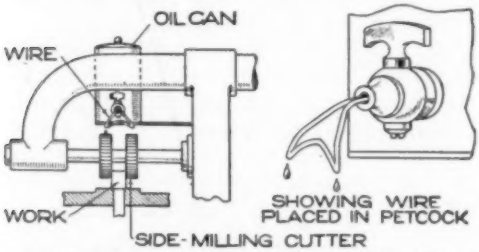
¶Piston rings should be left sharp on their edges, and rounded off only enough to remove a slight burr.

Time-Saving Kink in Bending Conduit Pipes

It is often difficult to draw wires through conduit pipes after they are in place, especially if the pipes are curved. By dropping a small weight attached to a cord through the pipe before it is bent, this difficulty is avoided. The cord is permitted to remain in the pipe while the bends are made in it and is used in drawing the wires through.—Contributed by D. B., Chicago.

Oiling Straddle-Milling Cutters

When two or more side-milling cutters are used in straddle-milling work the even oiling of each cutter is not infrequently a matter which keeps the operator busy with an oilcan. The sketch shows a little kink illustrating how a piece of wire can be bent and inserted in the mouth of a petcock in the large oilcan placed above the cutters, to run the oil evenly, drop by drop, on both cutters. Only a little adjustment will be necessary. A piece

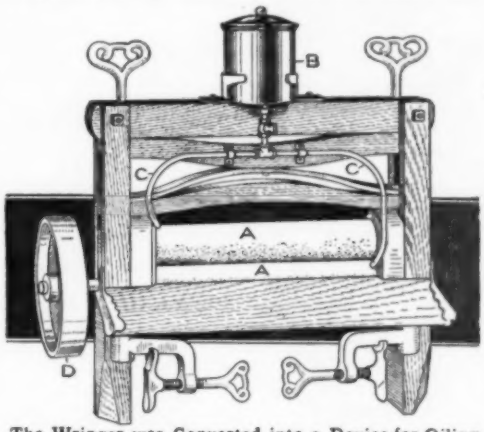


A Bent Wire Inserted in the Petcock Distributes Oil Evenly on Two Cutters

of 1/16-in., or even smaller, wire can be utilized, and it will be found a very handy method of steadily oiling cutters on long pieces of work.

Oiling Sheet Metal for Stamping or Punching

A discarded wringer was used with satisfactory results for oiling sheet metal in the punch-press room of a large factory. The fittings which were added to the wringer may be seen in the sketch. The rubber was removed from the rollers A, and felt was substituted. The oil pan B was attached to the top of the wringer, and tubes, C, were fitted to carry oil to the rollers. A pulley, D, was fixed on the shaft in-



The Wringer was Converted into a Device for Oiling Metal in a Punch-Press Room

stead of a handle and a belt drive connected with it. A drip pan was placed under the wringer to catch the waste oil. The sheets of metal were fed between the rollers and were carried through by the friction. The adjusting screws at the top were used to produce the proper tension.

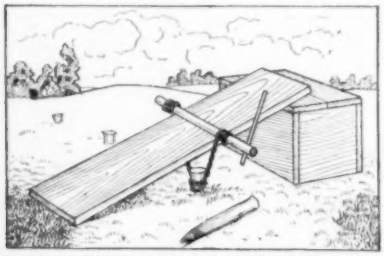
Odd-Sized Tubing Hammered from a Smaller Diameter

A piece of brass tubing, 3 5/16 in. in outside diameter and 6 in. long, was needed for an experimental job. No exact requirements as to finish were imposed, but the tube was to be seamless. The most desirable piece of tubing available was 3 in. in diameter with a wall of 3/32-in. thickness. A piece, 5½ in. long, was cut off and annealed by heating and plunging into water. It was then placed upon the anvil horn and hammered. After this treatment, the outside diameter was increased to that required, and the resulting tube was fairly round and smooth. Its length was increased to 6 in. by the hammering.

¶Indications at intervals of 6 in. on the handle of a post auger will aid in determining the depth of the hole.

Vertical-Pull Windlass

Withdrawing of posts or small stumps from the ground may be accomplished readily by the use of the

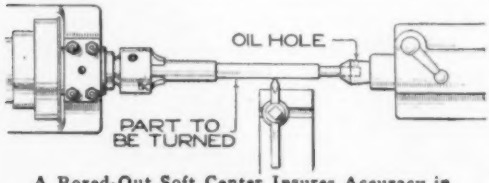


The Windlass Exerts a Powerful Upward Pull and Is Useful in Removing Stakes or Small Stumps

device shown in the sketch. It consists of a box or other support for a strong plank, on which a roller provided with a chain operates. The chain is attached to the roller at each edge of the plank so that when pressure is applied on the handle, tending to roll the roller up the incline, the chain winds up and exerts a powerful pull on the stump, or other object, to be withdrawn. The slant of the plank aids in the action, since it causes the chain to wind up rather than the roller to move up on the incline.—Contributed by J. H. Moore, Hamilton, Canada.

Hollow Center for Re-Turning Spindles

The problem of accurately turning a number of small spindles, from which the end centers had been cut, was solved in the manner illustrated in the sketch. A soft center was obtained and bored out, as shown, in the tailstock center in which an oil hole is indicated. The small end of the



A Bored-Out Soft Center Insures Accuracy in Re-Turning without End Centers

spindle was inserted into this socket and the other was clamped in a three-way, draw-in chuck, placed in the headstock spindle. The oil hole shown should be turned so as to come at the top, but, for purposes of illustration, is shown in a horizontal position. This feature is necessary in order that the end of the spindle may not be damaged in wearing against its socket.

Preparing Sensitized Paper for Photography

A good quality of unwatermarked, unglazed paper, free from imperfection, should be used in the preparation of sensitized photographic papers. A dark room with red light should be used and the paper stored in the dark when completed. Distilled water is best for making the solutions, and the silver-nitrate solution should be protected from the light particularly. Great care must be used in their application to the paper, so as to make the film over the surface of even weight. The sensitized side of the paper should be marked at points which will not injure it in use.

Several kinds of paper in common use may be made by the following processes:

A nitrated paper is prepared by applying a solution of silver nitrate in water and alcohol to the surface of the paper. Brushing in one direction only, apply the solution with a sponge, or soft-bristle brush. The stronger the solution, the more sensitive the paper, the alcoholic solution giving the more sensitive surface. After drying, the paper may be printed, and is fixed by washing in water.

A muriated paper is prepared by soaking it in a water solution of sodium chloride, removing the excess with blotters and drying the paper. After drying, brush the surface with a solution of silver nitrate. For the sodium-chloride solution use 50 gr. of sodium chloride to each ounce of distilled water, and brush the surface with a silver-nitrate solution containing 120 gr. of silver nitrate to each ounce of water. The muriated papers are fixed by first washing in warm water, then dipping several times into a solu-

tion of 1 oz. of sodium hyposulphite in 1 pt. of water, and finally washing in water and drying.

A less sensitive muriated paper for copying engravings, drawings, botanical specimens, etc., may be made by using a sodium-chloride solution of 25 gr. to the ounce of water, and a silver-nitrate solution containing 90 gr. to each ounce of water.

An iodized paper may be made by first brushing the paper with a solution of 100 gr. of silver nitrate in 1 oz. of water and drying it, then dipping it into a solution of 25 gr. of potassium iodide in 1 oz. of water. Wash in water, drain off the excess water, and dry.

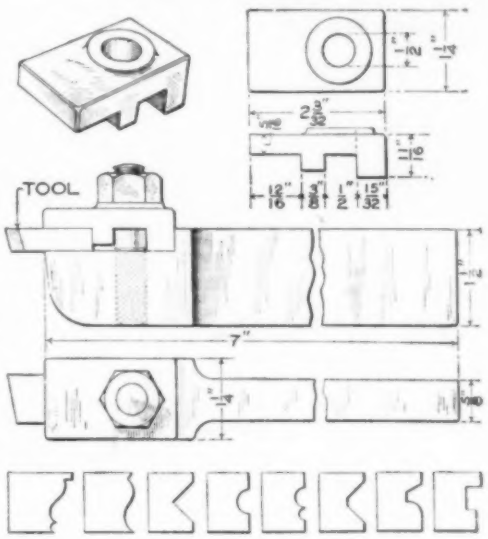
A bromide paper is made by soaking it in a solution of 40 gr. of potassium bromide in 1 oz. of water, and drying. When dry, brush over it a solution of 100 gr. of silver nitrate in 1 oz. of water. A compound chroma-type paper may be made by washing the paper with a solution of 10 gr. of potassium dichromate and 20 gr. of copper sulphate in 1 oz. of water, and drying. After exposure, the paper is washed in the dark room with a solution of 40 gr. silver nitrate in 1 oz. of water, and then fixed by washing in water.

A rapid paper may be made by mixing 6 dr. of a saturated solution of bichloride of mercury with 1 pt. of water. Float the paper on this solution and then dry it. This may be done in the light. In a dark room, brush the surface of the paper with a solution of 38 gr. of silver nitrate in 1 oz. of water, and dry. Print the paper in bright sunlight, 2 to 10 seconds. Develop it in a solution of 15 gr. sulphate of iron, 25 gr. glacial acetic acid, and 1 oz. of water. The development must be watched closely, and when it reaches the desired point, wash the paper quickly in water and fix in a sodium-hyposulphite solution as given for muriated papers.

Ordinary blueprint paper for photographic work may be made by first preparing a solution of 1 oz. potassium ferrocyanide in 6 oz. of water and another solution of 1 oz. of ammonio-citrate of iron in 4 oz. of water. When ready to use, mix equal parts of each of these solutions and apply the mixture to the paper evenly with a brush or sponge. Fix by washing thoroughly in water.—Contributed by Charles E. Mullin, Huntingdon, Pa.

Tool Holder with Set of Cutters

A tool holder adapted for many uses in turning brass and other light metals,



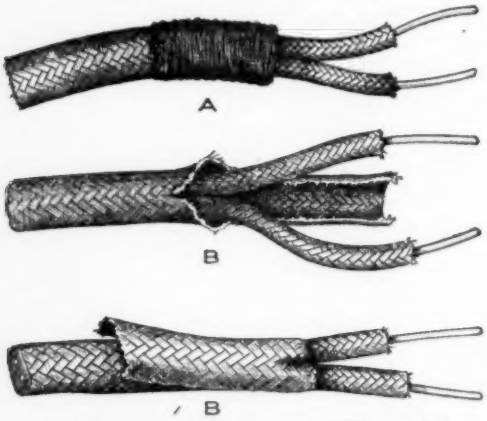
Various Types of Cutters may be Designed to be Clamped in the Holder

as well as the scraping of harder metals, is shown in the sketch. A series of specimen cutters, which may be shaped on both ends to give two cutting edges, are shown below. The main portion of the tool holder and the clamp are made of mild tool steel. The cutters are ¼ in. thick and are made of high-speed steel.

The construction of the tool holder and clamp is such that it may be readily carried out by the average mechanic. The ½-in. screw and nut are of standard thread and size. The clamp is designed with two shoulder portions in order that the bit may be gripped firmly and not shift while the nut is being tightened with a socket wrench, part of the equipment of most lathes.—Contributed by Joe V. Romig.

Pulling Wires into Conduits

A very convenient and easy method for pulling wires into conduits is shown in the illustration. It often happens that

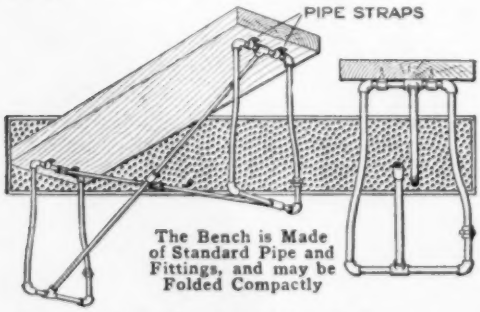


The Braiding as It Slips Back on the Wire, and How to Hold It at the End

the braiding on the wire slides back to such an extent that it is almost impossible to pull the wires into the conduit. The usual trouble is encountered as shown at A, and the way to prevent it is shown at B. The outer braiding is cut and folded back, preventing the covering from sliding back. — Contributed by E. Aultman, Jr., Haworth, New York.

Portable and Collapsible Bench

Observation of a plumber setting up a temporary workbench suggested the adaptation to a lawn bench, shown in



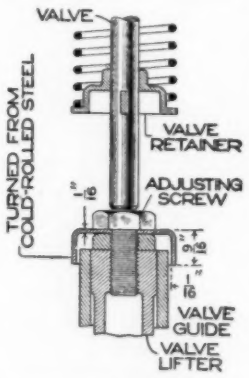
The Bench is Made of Standard Pipe and Fittings, and may be Folded Compactly

the sketch. Standard pipe fittings were used in its construction. The tee at the bottom of the upright is large enough to slide on the pipe. The bench is "knocked down" by releasing the unions at the middle of the braces, permitting the supports to be folded compactly under the top.

By using pipes proportionately larger, heavy workbenches or tables may be made in the same manner. A collapsible back might be fitted to the bench, and folding arms placed at the end.

Keeping a Valve Lifter Clean

The cover illustrated was made for a valve lifter on an automobile engine.



The design of the lifter made it easily exposed, and the grit and dust which found their way into the lifter rod caused a great deal of annoyance, necessitating frequent repairs and cleaning.

The device consisted of a cap, which was turned from a piece of bar stock, of the shape and dimensions shown in the sketch. It was placed between the adjusting screw and locknut, where it was securely held in place. The upper portion of the valve-lifter parts was completely protected by the cap, and no further trouble was encountered.

Obtaining Sharp Impressions from Dies

Die and tool makers often wonder why they do not get sharp and full impressions from dies, especially when the recesses are of unusual depth. If a small hole is drilled in the recess to permit the air to escape when the impression is made, the results will be gratifying.

¶Crude petroleum oil, diluted with gasoline, makes a good brown wood stain, resembling dark-oak finish.

Core-Drier Pattern for a Manifold

[The method by which a high-school boy made a successful pattern, after patternmakers had failed in several attempts, is set forth in this article. Doubtless the mechanics would have succeeded also, had they persisted, but the boy's success illustrates that intelligent effort is the basis for accurate workmanship, with the skilled workman as well as with the novice.—Editor.]

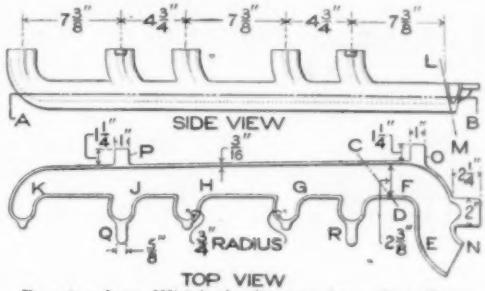
AMONG other things manufactured in a foundry were manifolds for the engine of a high-class automobile. It was a new job for the plant, and the core room was at first working with the temporary arrangement of a baked-sand drier for this manifold core. The task of making a pattern for a cast-iron drier devolved upon the pattern shop.

The castings from that pattern, when made, would treble the output of cores in the core room. The bunglesome sand drier weighed almost 100 lb., and was difficult to handle.

The patternmaker used the very latest methods to construct the core drier. A perfect core was secured and a plaster-of-paris cast made about it. This cast was to become the pattern. By removing the waste portions it was easily taken out. Two considerations were of main importance in the making of the pattern: shrinkage and a reduction of material that would give the least possible weight to the drier. It is, therefore, easy to see how delicate a performance it became. The three first casts were spoiled before the pattern went into the sand. The fourth, which was considered a finished pattern, was in wind and off on the shrink when the core was tried in the resulting casting. This pattern was thrown away. The last cast was worked up in an attempt to overcome the two points listed against the last pattern. It crushed in the ramming, and at this point the patternmaker gave it up as a bad job.

A high-school boy who studied patternmaking in school and had free entrance to the plant, had been watching the developments with growing interest, and when the regular workman gave up the job, he asked the owner of the foundry for the privilege of attempting to make the pattern, with the understanding that he was after experience and not money. It was granted quickly. A blueprint of the manifold was provided, also one of the baked cores.

At the school shops the matter of

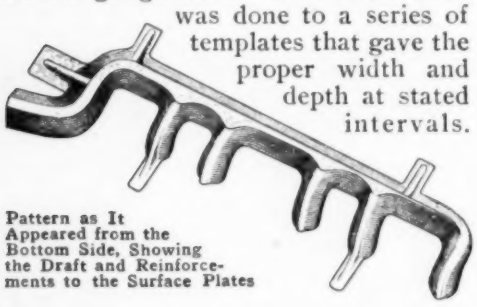


Drawing from Which the Pattern for a Core Drier was to be Made

making that pattern became, in a sense, an "acid" test. Its making was granted as a substitute for the regular pattern work. His observations had convinced the boy that the pattern should be made of wood, and the ultimate result showed that he was right. The patternmaker's drawing was made with the greatest possible care. The regular cast-iron shrinkage of one-eighth was allowed. All the measurements were derived from the blueprint of the manifold and the core. The distribution of the shrinkage varied only where the metal became less bulky, or where it ran slightly over the average in bulk, and there the dimension was recorded scant or full on the shrink rule, as the case demanded. It is evident that good judgment was most important here. The sketch shows the drawing from which the pattern was made.

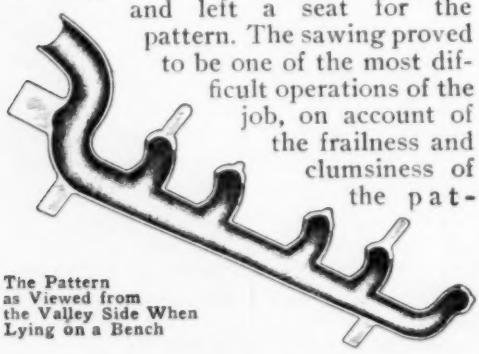
The very best grade of straight-grain mahogany was used in making the pattern. A piece, 4 in. wide and 1½ in. thick, was trued up for the body. This is indicated in the sketch by the portion below the line AB. It was cut, and a half-lap joint with shoulders was made on the angle indicated by the line CD. The object of this was that the

grain should not run short on the reverse curves of the discharge port. The outline of the valley was then laid out for the gouge work. This latter work was done to a series of templates that gave the proper width and depth at stated intervals.



Pattern as It Appeared from the Bottom Side, Showing the Draft and Reinforcements to the Surface Plates

These points were taken just in front of the discharge point of each exhaust, indicated by the letters E, F, G, H, J, and K. The gouge work in the valley was not completed until after the extensions for the exhausts were placed. These were made of blocks of the right thickness, to bring the horns to the proper level, and were then glued to the body. The grain in these blocks ran crosswise to the body. When their shells became better established, the glue was reinforced with brads carefully placed. The outline of the shell for the horns was laid out as on the body piece, and the gouge work was then done in the rough. All the work, thus far, had been done on the valley. The table of a band saw was tilted to give the angle indicated by the line LM. This gave the pattern draft on the body, eliminated all surplus stock, and left a seat for the pattern. The sawing proved to be one of the most difficult operations of the job, on account of the frailness and clumsiness of the pattern. The outline of the top of the horns was next sawed, with the table only slightly tilted. The reduction of the outside of the horns, from the outline of the top, had to be accomplished with care, as the saw left the surface that merged into the general contour of the body irregular in form. Draft had to be closely watched in this work.



The Pattern as Viewed from the Valley Side When Lying on a Bench

The final dressing of the valley was next taken up. The core was sawed into sections, each containing one exhaust, making six parts in all. On each of the sections a white line, indicating just where the drier should come when the core was in place, was drawn. These sections became templates, to which the valley was made to conform with the proper amount of clearance. Establishing the floor of the valley was a vital point, for it was explained that when the drier was in use and was carrying a green core in the oven, during the process of baking, the core at a certain stage would "fall," if it did not have a perfect bearing on the floor of the drier. This would give a core out of true, and if used in making a casting, it would make a thin place in the walls.

The placing of the surface plates N, O, P, Q, and R, which served as bearings on the faces of the core box during the making of the green core, was the last operation in the construction of the pattern. They were housed into the edges of the body and supports placed below them. That marked N was used as a supporting platform for a pack of green sand around the last exhaust, this device taking the place of the horns used on the other exhausts.

The pattern was given its finishing sanding and was then shellacked. It is well to note that during the construction every possible precaution was taken to prevent warping. When the work was left, even for a short time, it was clamped to a stretcher. The new part, even though not entirely completed, was given a light coat of size. A high grade of shellac was used for the coating. Thus, when the pattern went to the sand, it had neither warped nor twisted.

The first casting proved that the young man had made good. The first core tried fell into place perfectly. The

shrink had been gauged correctly, and that was the real test. Outside of a few minor changes for the sake of a better draft, the pattern was never altered and went its way to serve the purpose for which it was made.

Lettering for Curved Signs

Letters in curved signs may be laid out with the sides parallel, which is difficult for the novice, by the method shown in the illustration. The process is as follows:

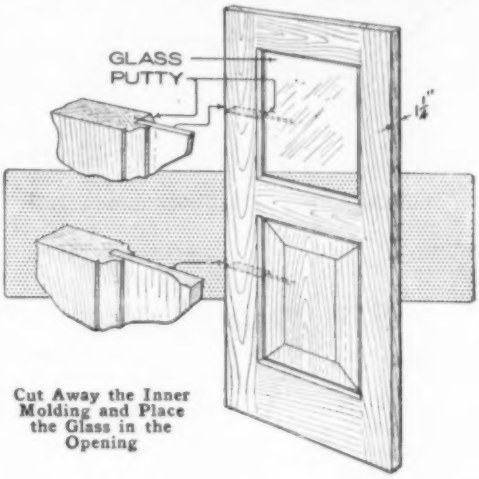
Mark the line AB with a piece of crayon, or with a cord chalked and sprung. From the point C as a center, strike off the curves at the top and bottom of the lettering. Mark off the space, D, between the letters, and their width, E, along the upper curve. At A lay off the distance FG equal to the width of the letters. With a straightedge or a chalked cord strike off the lines for the sides of the letters, as shown, and complete them by drawing the other parts of the outlines with a straightedge and crayon. This will make the letters uniform in width, and

The Sides of the Regular Letters will Be Parallel if Laid Out as Shown

their sides will be parallel. In the illustration a letter comes at the line AB and the space for it must, therefore, be divided equally, and the other spaces and letters laid off from it.

Glass Panels in an Old-Style Closet Door

Replacing wooden panels in old doors with glass may be readily accomplished, as shown in the drawing.



Cut Away the Inner Molding and Place the Glass in the Opening

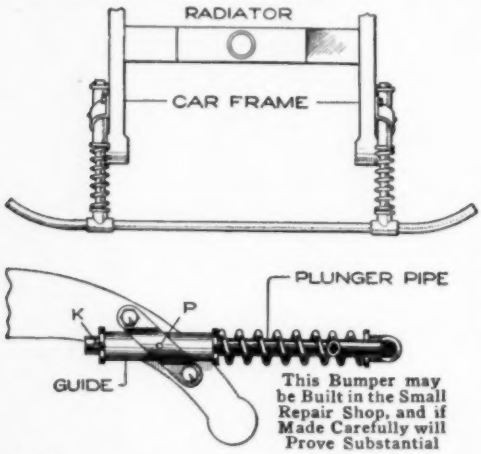
In order to remove the old panels without altering the front of the molding portion, cut away the molding on the inside of the door. Clean the corner of glue and dirt, and place the glass in the opening. Three-cornered glazier's tacks are driven into the door frame to hold the glass, and the corner cut away is filled in on a bevel with putty, as shown in the upper cross-sectional view. Below is shown a sectional view of the door as originally constructed.

Securing Door with Loose-Pin Hinges

Loose-pin hinges on doors of cabinets and other similar constructions often permit intruders to gain entrance by removing the pins from the hinges and lifting the hinge edge of the door outward. This may be overcome by fixing pins cut from a wire nail into the edge of the casing above the upper and below the lower hinges. Holes drilled into the edge of the door to fit the pins prevent the withdrawal of the door even after the pins are removed from the hinges.—Contributed by George Niederhoff, St. Louis, Mo.

Homemade Bumper for Automobiles

Steel tubing forms the main portions of the automobile bumper shown in the sketch. It was designed with a

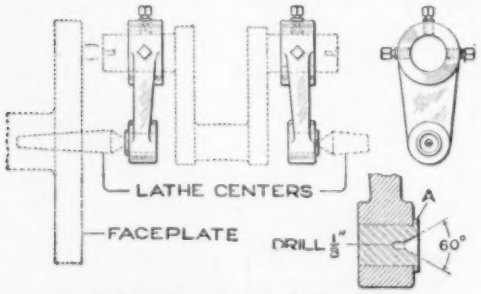


This Bumper may be Built in the Small Repair Shop, and if Made Carefully will Prove Substantial

minimum of special fixtures and is easily applied. The guide pipes are fastened to the side of the car frame by means of straps and are prevented from moving endwise by a pin, P. The plunger pipes are held in place by the washer and pin K. Strong helical springs were used. The fitting of the tubes and plunger parts must be done carefully to insure that the bumper will be substantial.

Crankshaft-Turning Fixture

A one-cylinder marine engine was being made in a small machine shop and the crankshaft-turning fixture,

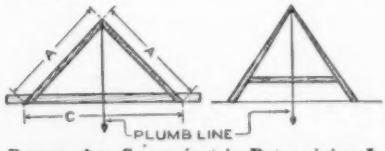


The Levers Taken from a Junk Heap Solved the Problem of a Turning Fixture in a Small Machine Shop

shown in the sketch, was quickly made and used successfully. Two old levers taken from the junk heap were used. Their lower ends were plugged with steel, as shown at A, and centers made. The levers were then fixed to the main bearings of the crankshaft and the entire unit was held between the lathe centers. Three setscrews were provided for each lever, to insure rigidity.

Plumb-Bob Level Quickly Made

Often it is desired to level, or plumb, a surface when no spirit level or plumb is available. The devices shown in the sketch may be made quickly of materials usually at hand where construction is under way. The sketch at the left shows a level made of three strips or boards. Measure off a distance, C, on the lower strip. Mark the center point covered by the plumb line carefully. Cut two pieces, A, of exactly the same length and fit them to form an angle with their lower corners exactly over the marks limiting the distance C. When the lower piece is level a plumb line suspended from the point at the

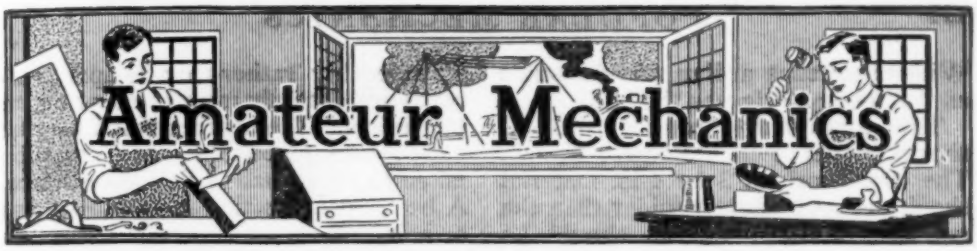


The Frames Are Convenient in Determining Levels When a Spirit Level Is Not Available

top will strike the mark at the center on the lower strip.

For use on irregular surfaces the device at the right is useful. Two poles of equal length are fitted together, and a piece braced across them forming a triangle having its two upper sides equal. Mark the center of the cross strip and attach the plumb line at the top of the frame. When the plumb line is exactly over the center mark on the cross strip, the points on which the lower ends of the poles rest are on a level.—Contributed by H. J. Cornthwaite, San Jose, Cal.

¶The fine cutting edge of a tool should never be exposed to the hottest place in the fire; heat the heavy part first and allow the heat to run to the thin edge.



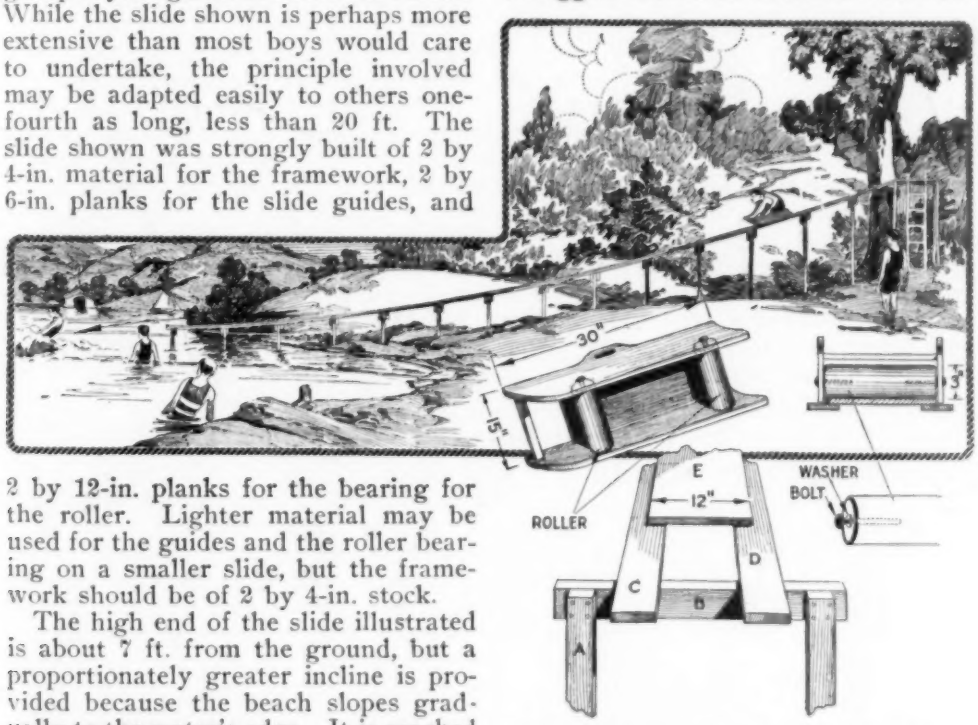
Water-Coasting Toboggan and Slide

By D. J. HOUGH

COASTING down an incline and being projected through the air to plunge into the warm water of a summer lake, or other outdoor bathing spot, has thrills and excitement that appeal to the person seeking a new aquatic diversion. The illustration shows a slide, and the toboggan sled for use on it, that were built by a group of young men at a summer resort. While the slide shown is perhaps more extensive than most boys would care to undertake, the principle involved may be adapted easily to others one-fourth as long, less than 20 ft. The slide shown was strongly built of 2 by 4-in. material for the framework, 2 by 6-in. planks for the slide guides, and 2 by 12-in. planks for the bearing for the roller. Lighter material may be used for the guides and the roller bearing on a smaller slide, but the framework should be of 2 by 4-in. stock.

The high end of the slide illustrated is about 7 ft. from the ground, but a proportionately greater incline is provided because the beach slopes gradually to the water's edge. It is reached by a ladder fixed to a tree, which acts as an end brace for the slide. If no such natural support is available, the end of the slide must be strongly braced on three sides, to insure safety. It is inadvisable to build the slide unduly high to provide the necessary incline, since this may result in accidents. A location where the ground is suitable should be selected rather than assume danger or risk.

The end of the slide nearest the water may be given a slight upward turn, so that when the toboggan leaves it the rider is carried upward before striking the water. The hold on the toboggan should be retained when entering the water, as injury may result by failure to clear it in the plunge.



Thrills and Excitement That will Satisfy the Swimming Enthusiast and Provide a New Summer Diversion at the Lake or River may be Had from the Water Toboggan and Slide. It may be Adapted to a Smaller Size and Built by Boys. The Details of the Toboggan and the Construction of the Slide are Shown in the Sketches Above

With experience a dive may be made as the toboggan leaves the slide.

The construction of the slide is shown in detail in the lower sketch. The framework of 2 by 4-in. material should be only slightly wider than the guides, and the supports should be spread toward the ground to give rigidity. The supports A should be nailed firmly, or bolted, to the horizontal members B. If lighter stock is used, the pieces at B should be nailed in pairs, one on each side of the uprights. The guides C and D should be of smooth lumber, and the edges of these pieces, as well as of the bearing plank E, should be rounded off to remove splinters. The joints in the sections of the guides should be made carefully and placed over the framework supports. They should be reinforced from the lower side by plates of wood.

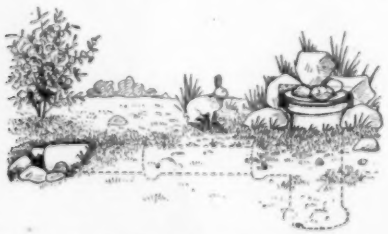
The bearing plank E is of 2-in. stock and 12 in. wide. It may be made of lighter material in a smaller slide. The joints in it should likewise be made carefully, to insure smooth riding over them. They should be set directly over the framework supports, but not on those over which joints have been made in the guides. The plank forming the bearing for the roller should not extend to the end of the slide at the lower end, but should be set back about 18 in. This permits the toboggan to slide off smoothly rather than to spring directly into the air from the bearing on the rollers. The bearing plank may be nailed into place, but care must be taken to set all nails below the surface. A better construction is to use screws or bolts. Bore holes for them through the plank, countersinking their heads.

The toboggan, as shown in the detail sketches, is built strongly, and is to be fitted over the 12-in. bearing plank, allowing ¼-in. play on each side. The sides are of 1¼-in. stock and high enough to accommodate the rollers, which should be about 3 in. in diameter. The dimensions of 15 in. in width and 30 in. in length, on the top surface, are suggestive only, and will vary with the materials used. The toboggan will not stand the necessarily hard wear unless good-quality oak, or other hard wood, is used. The top and foot brace should be fixed strongly with screws, their heads countersunk.

The rollers are fixed in the sides by means of screws, or a bolt may be set through the length of the roller. In either case the bearing should be in holes bored through the sidepieces. Washers should be fitted at the sides of the bearings, and the latter must be kept greased. All the edges and corners of the toboggan should be rounded off so that there is little possibility of injury from slivers or contact with the edges.

Tile Trap for Rabbits

Rabbits may be trapped in order to rid grounds of them, or for food purposes, by the use of the tile trap shown in the illustration. A tee, having a smaller opening of 6 in., is set in the ground with the large end projecting. Rocks are placed around it and it is provided with a cover. Several extensions are attached to the 6-in. opening and the end permitted to project slightly from the ground. Rocks are also placed about this opening. The rabbit enters the trap at the small opening and is free to come and go from the burrow. By closing the small opening, the quarry may be taken out at the large opening.



By Closing the Smaller Opening, the Rabbit may be Trapped and Removed at the Cover

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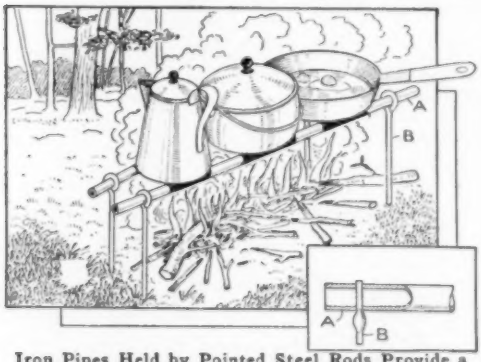
¶Vaseline is a good cleaner for commutators while machines are in operation and under load.

Dressing for Fishline

A quick-drying dressing for fishlines may be prepared as follows: Mix equal parts of boiled linseed oil and gold sizing; apply this to the line in a moderately thick coat. Dressing which will not dry as rapidly but which will resist the water as well is made by melting together 4 parts of paraffin and 1 part of resin. Melt the paraffin in a deep metal vessel over a small fire, and add the resin after the paraffin has dissolved. Care must be taken not to permit the fire to come into contact with the mixture. Allow it to cool slightly and then coil the line in the vessel. Draw it through a piece of wet sponge held between the fingers. This will cool the mixture rapidly and the line may then be stretched and polished with a wet rag.—Contributed by A. E. Tetu, Ottawa, Canada.

Utensil Rack for Camp Fire

A compact, simple device for holding cooking utensils over a camp fire is shown in the sketch. It may be collapsed into a small bundle and is of light weight, factors which are important in camping equipment. The device consists of two sections of pipe, A, supported on rods, B, having eyes bent at their upper ends. The lower end of the supports is pointed and

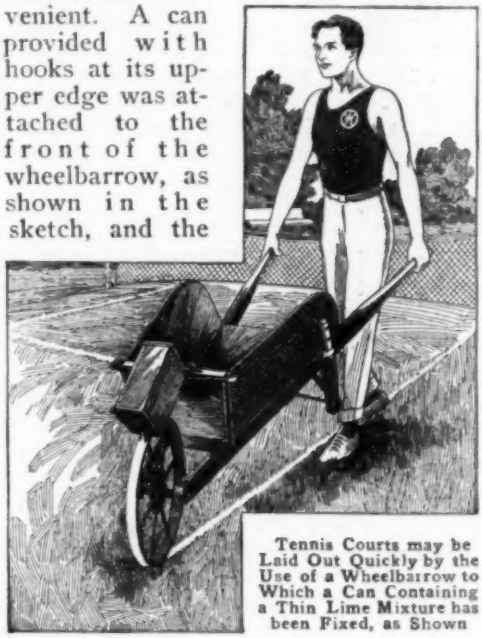


Iron Pipes Held by Pointed Steel Rods Provide a Simple and Satisfactory Support for Cooking Utensils in the Camp

may be driven into the ground so as to spread the pipes more at one end than at the other, thus providing for large as well as small utensils.

Wheelbarrow as Tennis-Court Marker

Many home tennis courts are not provided with a marker, and the use of a wheelbarrow for this purpose has been found convenient. A can provided with hooks at its upper edge was attached to the front of the wheelbarrow, as shown in the sketch, and the



Tennis Courts may be Laid Out Quickly by the Use of a Wheelbarrow to Which a Can Containing a Thin Lime Mixture has been Fixed, as Shown

lime mixture, very thin, poured into it. Holes were made at the lower edge of the can so that the liquid ran onto the wheel and was transferred to the court. The holes must be made large enough so that they will not clog quickly, and the mixture must be very thin. It is easy to cover the outline several times if necessary. Hence, to use a thin mixture will be found economical, rather than to waste time removing sediment from the spout.

Retouching Negatives for Printing

Portraits taken out of doors sometimes show unusually heavy shadows under the eyebrows and chin. The printing of these through the negatives may be altered by applying a little red or blue color on the glass side of the negative. Stippling the surface by contact with the texture of the skin also aids in removing the heaviness of such shadows.

Mat varnish, containing a small amount of iodine dissolved in it, and applied to the glass side of a negative, will cause much lighter prints than if the negative is permitted to remain with heavy shadows. The varnish will dry quickly, and it may then be scraped off carefully or removed with benzole from the parts of the negative which are not to be lightened. Care must be taken in scraping away the varnish in order to prevent scratches.

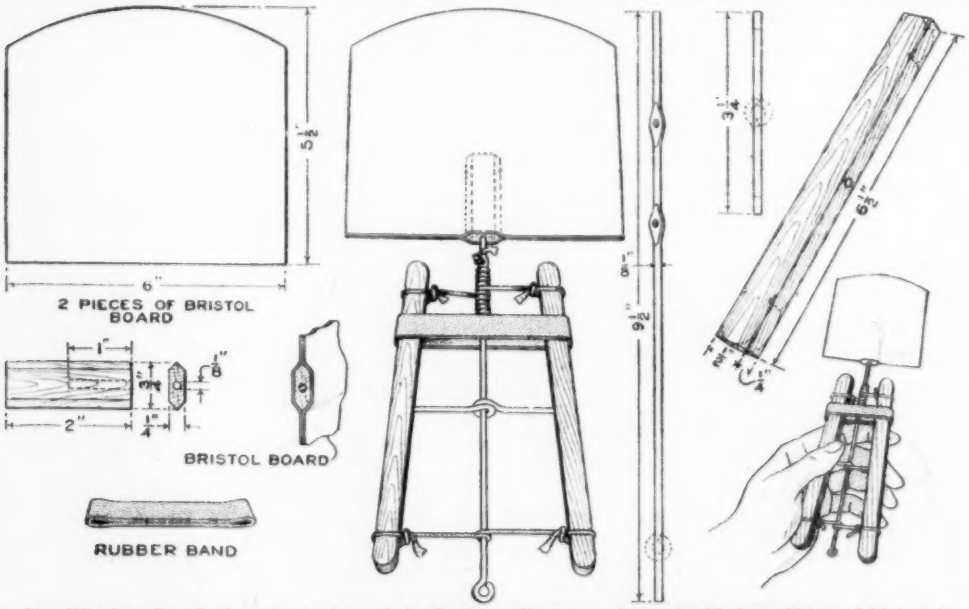
Hand-Operated Whirling Fan

The whirling fan illustrated is more convenient than a fan of the ordinary type, and may be made by a boy of only moderate mechanical skill. The materials necessary for its construction are easily available in the home. The sketch at the center shows the completed fan, and the smaller sketch at the right illustrates the method of operation. The details of construction are shown in the working drawings.

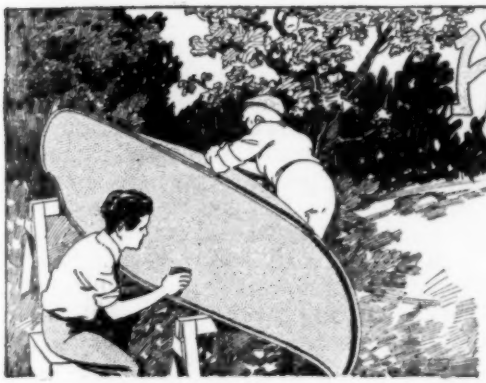
The wing of the fan is cut from a sheet of Bristol board, and is 6 in. long and 5½ in. wide. It is formed by gluing two pieces together, the upper end of the driving shaft being glued into place at the same time. The small sketch at the left shows the size and shape of the piece of wood into which the driving shaft is fastened at its upper end.

The driving rod, shown at the right of the larger sketch, is ⅛ in. in diameter and 9½ in. long. The flattened portions near the upper end are drilled to receive the ends of the cords which wind and unwind on the shaft at the top of the handles. A brace of similar wire is fixed near the middle of the handles so that they pivot on its ends when the lower ends of the handles are pressed together, as shown in the sketch at the right. The handles are of wood, ¼ in. thick, ½ in. wide, and 6½ in. long. Their ends are rounded, and slight notches are cut into the corners near the ends, to provide for the tying of the cords.

A wide rubber band, slipped over the handles near their upper ends, causes them to close at the top, and when the fan is in use this will reverse the rotation of the fan. It is necessary only to squeeze the handles inward, and the reverse action is repeated.



The Whirling Fan Is Superior to One of the Ordinary Variety and may be Made at Home of Materials Readily Available. The Small Sketch at the Right Shows the Method of Operation, and the Details of Construction are Shown in the Larger Sketch and in the Working Drawings



How To Build A Canoe

By Stillman Taylor

PART III

Fitting a Motor into a Paddling Canoe

A STANCHLY built canoe of sufficient length and beam may be converted into a light, serviceable, and convenient power boat by the installation of a light-weight motor of about 2 hp. While the craft thus becomes less available for shallow waters and cannot be used so readily on trips where portages are necessary, a power canoe has advantages in that longer trips may be undertaken with less regard for weather conditions. Greater speed and the fact that physical power need not be expended also increase the value and range of operations of such a craft.

Unless a motor of extremely light weight is procured, a canoe of frail construction and less than 16 ft. long is not likely to stand the jar of the driving mechanism. The canoe illustrated in the page plate is 18 ft. long, of 36-in. beam, and strongly planked, decked, and braced. A canoe of even broader beam would tend to give more stability in rough water, and if it is desired to transport heavy camping packs, or other material, in the craft, this factor should be observed particularly. Likewise, the depth and draft must be considered, as the carrying capacity and seaworthiness of a canoe depend in part on these factors. The fitting of the various parts of the mechanism and accessories must be done with the aim of balancing the load evenly. If properly disposed, the weight of these parts should tend to lower the center of gravity of the canoe, thus rendering it more stable.

The actual work of installing the motor and fittings should be preceded by careful planning and the making of a full-size diagram of the stern portion of the canoe as rebuilt. Too much care cannot be taken in this work, as, if it is neglected, the craft may be rendered unsafe, or the motor and fittings may not operate satisfactorily. The motor should be set in the stern, as shown in the illustration, as this will permit the use of a minimum of shafting and other fittings which must be accommodated. The exact location of the motor may vary with canoes and engines of different types. This should be tested out by placing the motor in the canoe and noting the effect on its balance in the water. For a canoe of the dimensions indicated, and a light-weight motor, 5 ft. from the stern is a satisfactory position. The motor should be placed as low in the canoe as possible, allowing the flywheel and crank case sufficient clearance below.

A convenient method of operation is as follows: Place the canoe on boxes, or sawhorses, taking care that it is properly supported about 2 ft. from the ground, or floor. Take measurements directly from the canoe, or part, to be fitted, whenever convenient. Procure two sheets of paper, 30 in. wide and 7 ft. long; mark one "diagram" and the other "templates," and use the former for the full-size detail and the other for the making of templates for curved or irregular parts.

Begin the diagram by drawing the base line AB, Fig. 3. This is the lower line of the engine bed and the upper surface of the ribs. Draw the line CD perpendicular to the base line, and 18 in. from the left end of the sheet. The

point C is the center of the stern end of the driving shaft. The dimensions of parts are not given, except in special instances, since they must be obtained from the particular canoe and other parts entering into the construction. Indicate the layer of ribs E, the planking F, and the keel G. Using the template sheet, cut a template or pattern for the curved stern. This may be readily and accurately done by fixing a straightedge to the keel and permitting it to extend to A. Rest the long edge of the sheet on the straightedge when fitting the template to the curve. Use the template as a guide in marking the curve on the diagram, as at HJ. The curve K, of the stern decking, may be indicated similarly.

Determine the distance the motor is to be set from the stern and indicate it by the perpendicular line L. Measuring from the base line, indicate the height of the center of the motor shaft from the floor, as at M. This should be made as low as possible, permitting sufficient clearance for the flywheel and the crank case. Draw a straight line from C to M, which will thus indicate the center line of the driving shaft. This line is fundamental in determining the dimensions and placing of certain parts and fittings, and should be established with extreme care. The size and exact position of the engine bed N may now be indicated. Its dimensions, given in detail in the perspective sketch, Fig. 5, are suggestive only. They may be varied in order to provide proper bearing on the floor, and so that the bolts holding the bed may pass through ribs. The cross brace at the forward end is important, and should be fitted carefully over a rib. The upper line of the engine bed must not be confounded with the center line of the shaft, for in many engines they are on a horizontal line when viewed from the forward end, yet not necessarily so. The slant of the engine bed must be made accurately, as any deflection from the angle of the center line of the shaft will disarrange the installation.

The shaft log O may next be indicated and a template made for use in guiding the bit when boring the hole for the shaft through it. The template used for the curve HJ may be altered by drawing the shaft log on it at the proper place. The point P, from which the bit is to be started when the shaft log is fixed into place, should be indicated and the center line of the shaft, extended to Q, may then be used as a guide for the bit. If the homemade type of bearing R is used, it should be indicated on the diagram. A metal bearing may be made, or a suitable one obtained from dealers in marine hardware. In the latter case it will probably be necessary to block up the bottom of the canoe in order to provide a flat, horizontal bearing surface for the bearing flange.

The rudder and other parts, which are not directly connected with the motive-power unit, may be indicated in detail on the diagram or be made from sketches of a smaller scale. Paper patterns, made full size, offer a convenient method of outlining the parts of the engine bed, the rudder, and other irregular pieces. When the diagram is complete, measurements may be transferred directly from it without reducing them to figures, and, wherever possible, parts should be fitted to it.

The shaft log, shaft bearing, and engine bed may be made of oak, or other strong hard wood. It will be found desirable to have the engine bed complete before an attempt is made to fit the shaft and its connections. It is made of 1½-in. stock, bolted together with lag screws and fixed firmly into the canoe with bolts. The heads of the bolts should be provided with cotton and red-lead packing, and care should be taken that the bolts pass through ribs.

The shaft log should be fixed into place before it is bored. Bolts may be passed through it and fastened on the inside if there is room for drawing up the nuts in the stern. Large screws may be used to aid in the fastening and smaller screws may be used from the inside. The lower rudder support will also aid in holding the log in place,

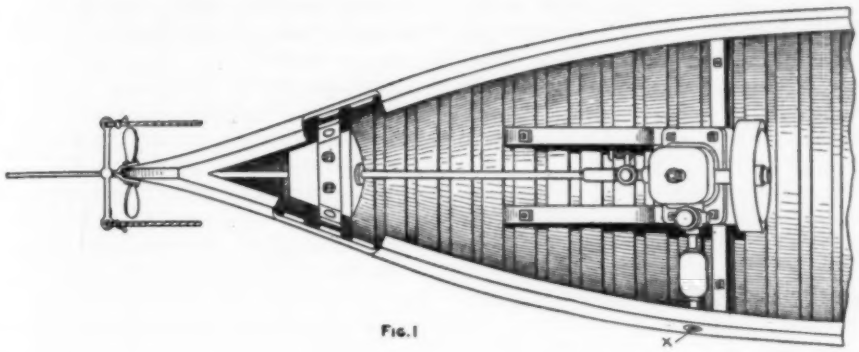


FIG. 1

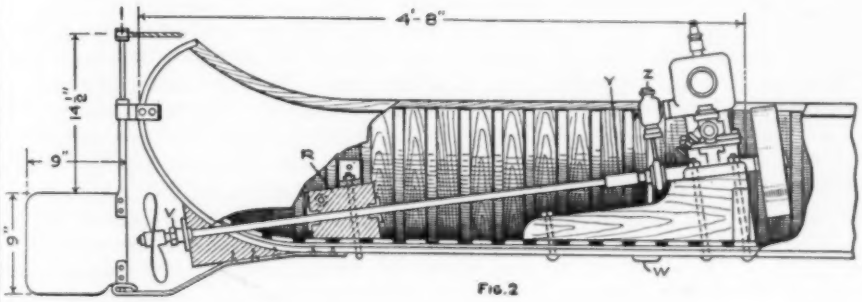


FIG. 2

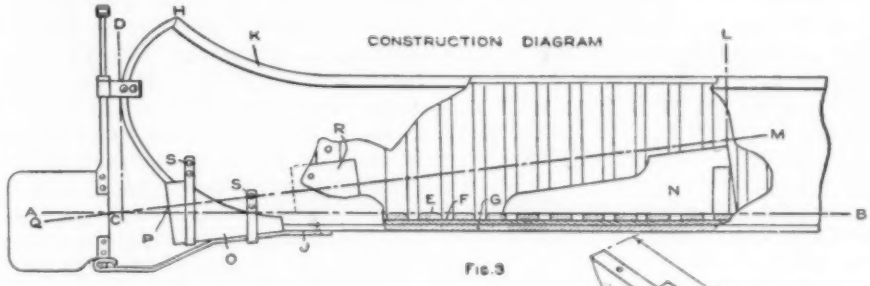
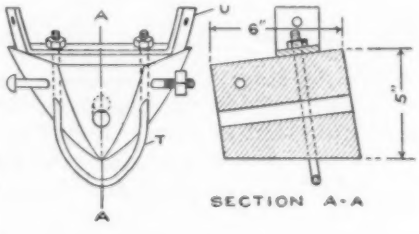


FIG. 3



SECTION A-A

FIG. 4

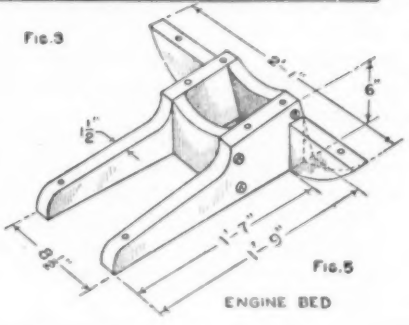


FIG. 5

ENGINE BED

A Light-Weight, Two-Horsepower Motor Installed in a Stanch 18-Foot Canoe will Increase the Range and Utility of Such a Craft; the Construction Shown Is Simple and within the Capabilities of a Careful Novice of Fair Mechanical Skill. A View of the Stern from Above is Shown in Fig. 1. The Engine is Shown Mounted on the Engine Bed, and near the Stern the Shaft Block is Shown. A Partial Sectional View is Shown in Fig. 2. The Relation of the Engine and Bed, Shaft and Fittings, Shaft Block, Shaft Log, and Rudder are Shown. The Construction Diagram, Fig. 3, is Described in Detail in the Text. A Larger-Scale View and a Section of the Shaft Block are Indicated in Fig. 4, and Fig. 5 Illustrates the Engine Bed with Dimensions and Fastening Holes

and the iron straps S, Fig. 3, will insure its rigidity. This is an important point in the construction, as if the log is not fixed positively, the thrashing of the propeller will soon loosen it.

A detail of the shaft bearing R is shown in Fig. 4. The hole to receive the shaft must be bored accurately, and the use of the template, as with the boring of the shaft log, is advisable. Flanged metal bearings are provided to take up the wear in the bearing block. The method of fastening the block, as shown in the detail view, insures a rigid bearing with a minimum of holes through the bottom of the canoe. A U-bolt, T, binds the double angle brace U and the block firmly to the keel. The angles of the brace are fixed into the sides of the canoe with bolts, and a bolt at the stern end of the block supports it further. The block should be placed so that it will bear on three ribs and must be fitted to the curve of the canoe.

The rudder is made of sheet metal supported on a rod or pipe. Its general dimensions are shown in Fig. 2. The fan of the rudder is riveted to its supports and rests in a bearing strip of ¼ by 1-in. strap iron, which is shaped as a guard for the propeller. The upper bearing of the rudder post is formed from a strip of iron, bolted to the stern, and the upper guide bar, to which the ropes are attached, is cut from an iron strip.

The propeller is 8 in. in diameter, but may be installed of a size suitable to the power, speed, and type of the motor used. The stuffing box V, Fig. 2, the bearings for the bearing block R, the intake strainer W, the exhaust outlet X, Fig. 1, and the shaft coupling Y are all of manufactured types that may be purchased of marine-supply houses.

The intake strainer W is placed in the bottom directly below the pump Z. The exhaust outlet X is placed above the water line, and a muffler should be installed to avoid noise from the exhaust explosions. The exhaust may be conducted under water or to a point near the stern. No indication is given for the placing of the gasoline tank, the supply pipes, electrical-energy source, and wiring. The tank may be placed in the stern of the canoe high enough to provide a good flow. A magneto may be used to give current for the sparking circuit, or batteries may be provided. They may be placed at any point convenient, and should be incased in a waterproof container.

In assembling the parts care must be taken not to wrench the shaft or other pieces out of line, and in general, it is well to fix nonadjustable parts solidly when they are fitted into place. This applies particularly to the engine bed and the shaft log. The bearing block may be adjusted vertically by adding packing, or by reducing the lower surface. The rudder and its fittings may be made in regular course, but should not be fitted until the power unit and driving mechanism is in place finally. The propeller may be protected from possible injury by laying it aside until needed. All the openings in the hull through which bolts or other fastenings are placed should be packed with red lead or other waterproof packing. The working parts and finished metal surfaces should be oiled or greased thoroughly as the parts are assembled, and the unfinished metal parts painted with red lead. This will protect them from moisture and aid in the smooth operation of the mechanism.

How to Make a Fluorescent Screen

Many experimenters have occasion to use a fluorescent screen, particularly those interested in X-ray work. Such a device is quite expensive if purchased, and may be made as follows.

Mix 1 oz. each of common salt, sodium tungstate, and calcium chloride. Place the mixture in a crucible and heat it dull red in a coal fire, for several hours. It will melt into a clear liquid, and should then be removed and permitted to cool. The liquid will crystallize into a hard glasslike mass. Break this out of the crucible and crush it into small pieces. Put them into a

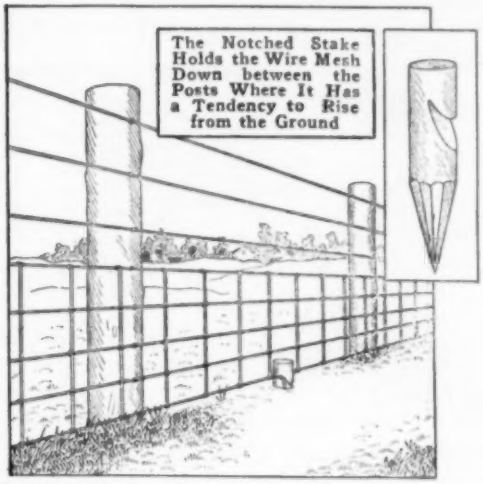
jar of clear water. The sodium chloride resulting from the chemical change by heating, will gradually dissolve and the calcium tungstate will fall to the bottom in fine crystals. Wash this precipitate until all trace of the salt disappears; then pour the crystals upon a sheet of filter or blotting paper to dry. After drying, place them in a mortar and grind them to a fine powder, when they will be ready for use.

To make the screen proper, procure a piece of thin white cardboard of the size desired. The calendered board known as three-ply is satisfactory. Paint the cardboard on one side with a thick solution of gum arabic in water, or better still, with celluloid dissolved in amyl acetate. Permit the gum to become "tacky" before dusting with the chemical. The latter process requires care, to produce an even layer on the cardboard, and it is advisable to practice with ordinary salt before attempting it on the cardboard for the screen. The calcium tungstate should be placed in a dry jar, and a piece of fine muslin fixed over the mouth of it. The chemical may be dusted over the surface with this sieve jar.

Shake off the superfluous crystals and permit the screen to dry thoroughly. Fasten a piece of mica, or sheet celluloid, over the sensitized surface to prevent damage to it. Mount the sensitized cardboard in a wooden frame of suitable size and arrange a hood around its edges to cut out unnecessary light. The sensitive side of the screen is, of course, held toward the observer when the apparatus is used.—Contributed by Chester Keene, Hoboken, N. J.

Preventing Wire Mesh from Rising between Fence Posts

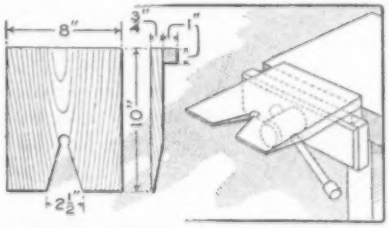
Fences which inclose pastures for hogs, or other smaller animals, are usually stretched to give rigidity and strength. Often the adjustment of the wire, after being put into place, causes it to rise from the ground between the fence posts, permitting the animals to escape. An effective method of holding the wire close to the ground is shown in the sketch. A peg, notched near its upper end, is driven into the ground so that the lower edge of the



wire mesh is held fast in the notch.—Contributed by O. B. Laurent, New Roads, La.

Jig-Saw Table for Vise

Those who have occasional work to be done with a jig saw will find the simple device shown in the sketch convenient. It provides a table for sawing light work. By holding it in a vise, as shown, a rigid support may be had. The table is made of a rectangular piece of ¾-in. wood, 8 in. wide and 10 in. long. At one end, a strip, 1 in.

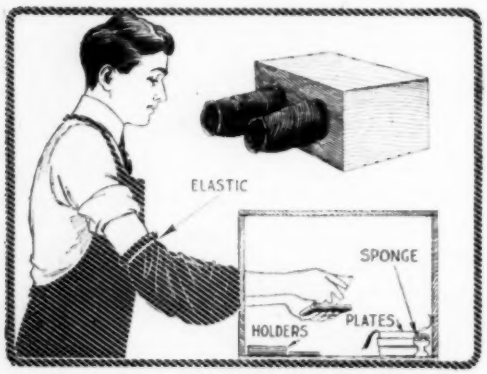


The Jig-Saw Table Provides a Rigid Support for Light Fretwork

square, is attached for clamping in the vise. The other end is notched to provide a place for the saw while in use.—Contributed by Victor A. Rettich, New York, N. Y.

Loading Box to Dispense with Dark Room

When a daylight developing tank is used, a dark room is needed only for loading the plate holders and for transferring exposed plates to the tank. These operations may be performed satisfactorily in darkness, using a large box with holes made in the side to admit the hands, as shown in the sketch. The box may be made of light wood or stout cardboard. The sleeves fitted to the openings are provided with elastic bands to insure that no light creeps in at the edges. The holders, plates, and sponge should be arranged conveniently in the box before beginning operations.



A Dark Room Is Unnecessary for the Loading of Plates When the Device Shown is Used

The box must be made light-proof by lining it with black cloth if necessary. If any difficulty is experienced in identifying the film side of the plates they may be marked with minute tabs at the corner on the film side, or identified by moistening the finger tip on the sponge and testing for a slight stickiness of the film side at the extreme corner. A red window might be fitted into the box, but the device has been found satisfactory without it. —Contributed by H. J. Gray, Lewes, Sussex, England.

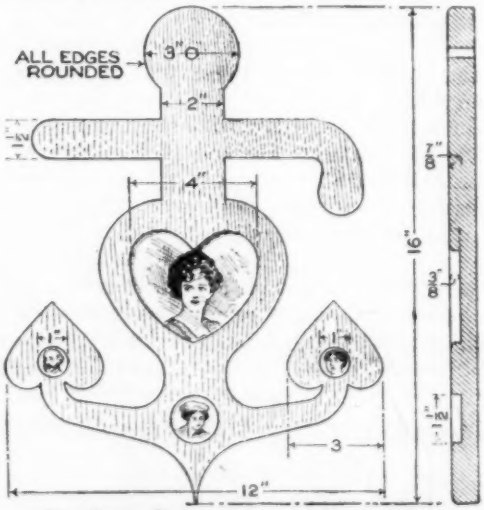
¶New brooms should be soaked in strong, hot salt water. This toughens the bristles and makes them last much longer.

Rubber Bands Made from Old Inner Tubes

Old inner tubes of bicycles, or other vehicles, may be cut into rubber bands of various widths which will be found to give good service. The tubes should be laid flat on a hard piece of board, or a piece of sheet zinc, and the bands cut off one at a time with a sharp knife held against a straightedge. In cutting them on wood, it is best to use a close-grained stock and to cut across the grain of the wood.

Sailors' Sweetheart Picture Frame

The boys on United States battleships are fond of making trinkets and souvenirs to be sent home, and the sailors' sweetheart picture frame shown in the sketch is a favorite. Speaking from experience, I know that many "landlubbers" will be interested in this novelty, although coming from a man-of-war makes it more interesting. I have been there and, therefore, I know. The place of honor in the center is of course reserved for the lady. The smaller picture openings may be filled with penny pictures of father and mother, or other relatives.—Contributed by Charles Rorer, Bridgeport, Connecticut.



The Center Panel is Reserved for the Sailor's Sweetheart, and in the Others Pictures of Relatives are Placed

Woven Reed Furniture

By CHARLES M. MILLER

Taborets and Small Tables for the Summer Veranda

[The various materials referred to in this article by number or size were described in detail in an article on "A Reed Basket," in the April 1915, magazine, page 625.—Editor.]

UTILITY and ready portability are well recognized features of woven-reed furniture, but the qualities which make it especially attractive for summer use in the open air, or on the veranda, are its inviting comfort and graceful lines. While furniture of this type arranged in suites makes a particularly harmonious showing, individual pieces may be used in combination with other furniture, lending a touch of variety. Small tables or taborets, of light weight and simple design, may be made by the novice, and may be adapted to a variety of uses. Footstools, jardinière stands, sewing tables, card tables, and smoking stands are some of the possibilities. Three representative types are shown in Figs. 1 to 3, and the general method of construction as well as the details of the weaving are also illustrated.

A serviceable taboret or stand is illustrated in Fig. 1. It is 18 in. high, and 17 in. in diameter on the top. The sides are 9 in. wide at the top and 14 in. at the bottom.

The framework for the top of the stand consists of a disk of wood, 16 in. in diameter, with a similar one, 14 in. in diameter, directly underneath, the edge being set under 1 in. all around. Four legs of 1-in. doweling support it, and two cross braces of doweling are placed between diagonally opposite corner posts, behind the woven portions of the side. The grain of the wood in the upper disk should run at right angles to that of the lower, to prevent warping, and the disks should be fastened together with nails or screws. Avoid putting them into the lower disk, where the legs are to be fixed.

To locate the position for the legs, draw a diameter on the under side of the top, as at A, Fig. 4, and 4 in. on either side of it draw parallel lines B and C. Draw another diameter, D, at right angles to A, and draw the parallel lines E and F 4 in. from the diameter D. Where the four outside lines intersect will be the centers of the holes for the legs. These holes are not bored perpendicularly, but are slanted to conform to the slant of the leg. A template should be used in guiding the bit, as shown at G, Fig. 4. It may be constructed of wood, 3 in. wide and 5 in. long, Fig. 5. Place the gauge just outside the edge of the hole to be bored. Nail it to the board lightly on the diagonal, as shown, and guide the bit against it.

Before the legs are fixed into place finally, the holes for the spokes of the side should be bored. The parallel lines of Fig. 4 now serve another purpose, that of giving the location of the spokes. Place one spoke ½ in. from each leg, and the others 1 in. apart. The legs are utilized as spokes in the weaving. The spokes should be double, and the extra spokes may be inserted beside the original ones, after the weaving has progressed a few rounds. Number 5 reed should be used for the spokes and No. 4 reed for

the weavers, which are woven back and forth around the spokes.

Drive the legs into their sockets, applying glue, and pin them with nails, as at H, Fig. 4. Tack strips on the bottoms of two pairs of legs and then fasten two strips to brace them, as shown in Fig. 6. The strips should be put on and the distance between the legs spaced before the glue sets.

It is best to weave the sides before beginning the top, so as to prevent rubbing the woven top while weaving the sides, with the stand inverted. The side spokes should be 2 ft. long and should be set into the top 1 in., with glue. Turn the top of the stand down on a table, and begin the weaving at the under side of the top. Single weaving is used for the sides, every other round passing twice around the legs.

There being four sides in the construction, there will be an even number of spokes, even though there should be an odd number to each side. The weaving would thus repeat itself, in going behind and before the same spoke each time. This is not desirable in this construction, and a change should be made each round. To do this, go over two spokes, instead of one, at the finish of a round. Such a "skip" is an Indian method, and forms a design that may be carried in slanting lines back and forth down the side of the stand. It is best to confine these "skips" to one side. Another way to overcome the repeat, as the weaving in and out around the same spokes in two successive layers is called, is to insert an extra spoke on one side, thus making an odd number of spokes around the stand. It is necessary then to conform the design of the open work for this side to the number of spokes. The design for the open work shown in Fig. 2 will be used for the stand illustrated in Fig. 1, and to be described in detail. The first of the two methods of overcoming the "repeat" will be used.

Insert the extra reed for doubling the spokes, after a few rounds have been woven adjoining the top. The method of weaving from the corner post and the making of the open design are shown in Figs. 7 and 8. The method of "pairing" for winding the reed in and out of the spokes, is shown in Figs. 9 and 10. The rear weaver of the pair of strands is thrown over the forward weaver, back of the next spoke and out. The fore weaver then becomes the rear one, and is thrown in like manner. This process is repeated in order to make the complete rounds. Figure 9 shows the weaving from the side, and Fig. 10 is a view looking down on top of the spokes and the edge of the weaving, shown in section. Pairing gives a continuous rope twist to the two weavers, and an even or odd number of spokes is equally suitable.

For the open designs of Fig. 2, one or more of which may be placed in the side of the stand, the center spokes are left free, as shown in Fig. 7. Before turning the first weaver back for the open work, as at M, start a short weaver N about two spokes back from the opening, and pair it with the regular weaver across the opening, and two spokes beyond. In turning back on the spokes, the single weaver goes twice around the spokes, as shown by the intermediate layers O. This is a short bend and the weavers must be very soft. Use short ones and wet them frequently with a sponge. A sectional view of the weaving at the opening is shown in Fig. 8, as it joins with the weaving around the corner posts. At K, the weaver turns back on a double thickness of reed, and at L, a short spoke is set back of the other two, and the weaver is wound around the three, thus lessening the abruptness of the winding. The latter method is the better. At the horizontal center of the opening, two rounds continue across the opening and around the stand. Pair a short piece of reed across at the finish of the openings, as was done at the lower end at N, Fig. 7.

After weaving to within 5 in. of the bottom of the legs, cut off the extra member of the double spokes, and soak the ends of the remaining spokes in water. Braid them into the border finish, as shown in Fig. 1. The corner posts serve as spoke spaces, and the

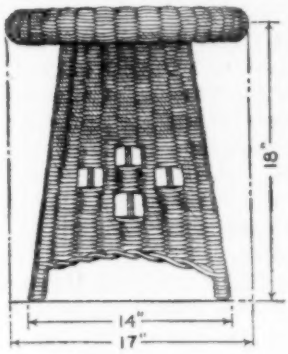


Fig. 1

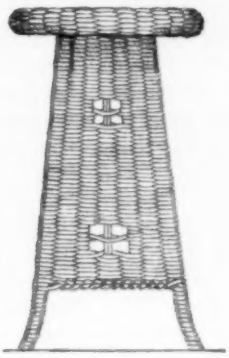


Fig. 2

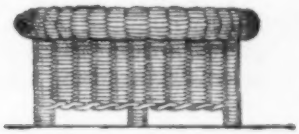


Fig. 3

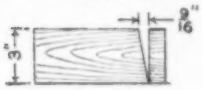


Fig. 5

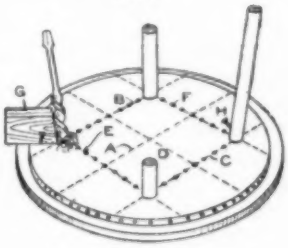


Fig. 4

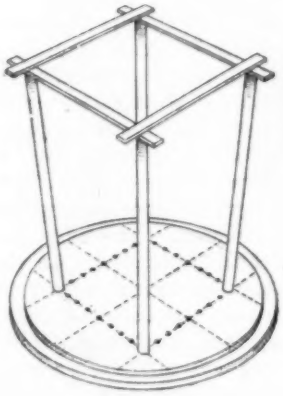


Fig. 6

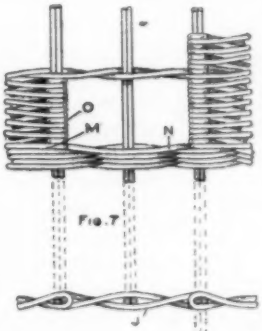


Fig. 7

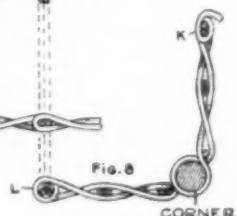


Fig. 8

Fig. 11

Fig. 12

Fig. 19

Fig. 20

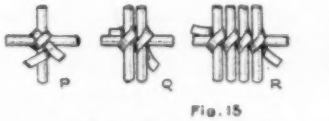


Fig. 15

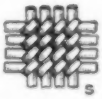


Fig. 16

Fig. 9

Fig. 10

Fig. 17

Fig. 18

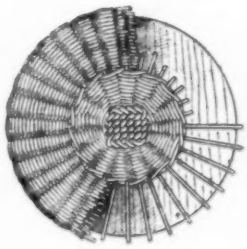


Fig. 13

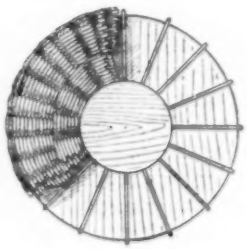


Fig. 14

Taborets, of Light Weight and Simple Design, may be Made by the Novice and Adapted to a Variety of Uses in the Home. They Are Particularly Attractive for the Summer Veranda. Sewing Tables, Jardinière Stands, Taborets, Footstools, Card Tables, and Smoking Stands Are Some of the Possibilities. A Taboret, or Small Stand, is Illustrated in Fig. 1, and the Details of Its Construction are Also Shown. The Tall Stand Illustrated in Fig. 2 Involves the Same General Principles of Construction, Modified to Suit the Framework. The Footstool Shown in Fig. 3 Is Typical of Stands Having Vertical Sides

spokes nearest them are wound around the bottom ends of the legs. Short spokes may be inserted beside the posts and wound around them if the ends of the spokes are not long enough for this purpose.

The top may be made next. Holes are bored horizontally into the edge of the under disk, as shown in Figs. 4 and 11. In Fig. 12 the holes are shown bored into the edge on an angle. This method gives a thicker rolled edge to the top, although both methods are satisfactory. These holes must be bored before the work on the top is begun. There are two ways of beginning the weaving for the top. The radial spokes may cross each other in groups of four, the upper and lower courses being bound together with winding reed, as shown in Fig. 13, or a small maple disk may be used as a center from which the spokes radiate, as shown in Figs. 14 and 20. The center-disk method is not difficult, and is used extensively. The other type is novel, and also quite feasible.

The spokes for the method shown in Fig. 13 are bound together in the following manner: Place two spokes at right angles to each other and wind them with winding reed, the end of the latter beginning between the two spokes, as shown at P, Fig. 15. The perpendicular spoke is uppermost. Add a second perpendicular spoke and bind it into place, as at Q. Continue this process until four perpendicular spokes have been bound in as at R. Place a second horizontal reed into position and go over each vertical spoke with a separate winding, as in the first course. Continue until four horizontal spokes are bound in, and the end of the winding reed is looped around the last, as shown at S. The spokes should be of No. 5 reed, and 24 in. long.

Four groups of four spokes each will result by following out the process described. Separate the spokes by drawing the outer ones into the corner spaces. They should have the appearance of spokes in a wheel, as in Fig. 16. Use two weavers of No. 4 reed, in the pairing weave, as shown in Fig. 16, and in detail in Figs. 9 and 10. Continue the pairing weave until a center, 8 in. in diameter, is woven. Crowd up the weaving closely, for the appearance of the top will depend much on the first few rounds. Hold the center with the left hand, and manipulate the weavers until they are well seated in their proper places.

When a few rounds have been woven, nail the center securely to its place on the middle of the top. This will leave both hands free for the weaving. After a disk, 8 in. in diameter, has been woven, begin the triple weave illustrated in Figs. 17 and 18. As the triple weave is begun, add another spoke, 8 in. long, between each pair, all around the top, making 16 new and 16 original spokes. When two or three rounds are woven, the new spokes will become secure. Continue the triple weave to the edge of the top. Measure and cut the end of the spokes to uniform length. Curve the ends over the edge to see how much will be needed before cutting, allowing about ½ in. for insertion into the holes in the edge.

Wet the ends of the spokes with water until they are pliable enough for the curve. Bending and tying them down while wet and permitting them to dry in this position, as shown in Fig. 19, is desirable also. Weave down the curve of the roll and insert the ends of the spokes in their respective holes with glue. Then with the single, plain weave on the under side of the roll, weave well up to the ends of the spokes.

For the disk-center method of construction, as shown in Figs. 14 and 20, use ½-in. maple, and cut it 5 in. in diameter for the centerpiece. To locate holes on the edge of the disk draw a line 3/16 in. from the upper edge and mark off spaces 1 in. apart, except four, which are made 15/16 in. apart, to make a convenient division, practically uniform. Bore the holes ¾ in. deep. Number 5 reed is used for the spokes and No. 4 reed for the weavers. The disk should be toenailed around its edge with brads, fixing it firmly to the top before the spokes are inserted.

Proceed with the pairing weave, as in the other method described, until 2 in. of the spokes is covered; then change to the triple weave and add additional spokes. Proceed as with the other type from this point on.

The taboret is braced by two 1-in. dowel rods, placed 2 in. above the bottom roll of the sides and extending from one corner to the other, diagonally. Their crossing at the center may be made into a halved joint, by cutting away one-half of each rod on the adjacent edges. The ends are fitted closely into the corners, and are nailed to the legs.

A taller stand or small table, the side weaving of which has been described as applied to the taboret shown in Fig. 1, is illustrated in Fig. 2. The construction in general is similar. A lighter roll is used for the top, and the bottom ends of the legs are curved outward slightly. The legs are curved by steaming the ends of the corner posts, clamping them into position, and permitting them to dry.

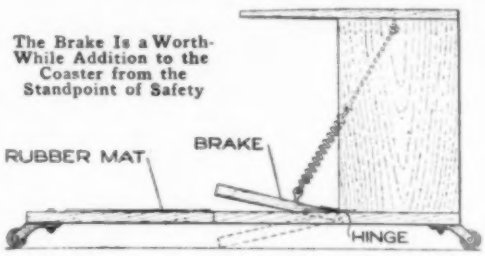
The footstool, shown in Fig. 3, may be made as a miniature stand, with vertical legs, and the spokes set in a circle under the top board. The spokes and weavers will carry the form, if well woven. The stool may also be braced, to withstand hard usage. It should be about 12 in. in diameter at the top, 10 in. in diameter for the body, and 6 in. in height.

The method of forming the opening shown in the side of the taboret in Fig. 1, and the weaving of the construction, will be readily understood from the method described. The principles and methods presented may be applied readily to other construction of the same general type. The physical limitations of reed, as a constructive material, and the necessity for a substantial framework must always be considered in such adaptations in order to obtain satisfactory results.

One ounce of nitrate of iron added to 8 oz. of hyposulphite of soda in a gallon of water and applied hot, produces a green finish on brass.

Coaster with Safety Brake

Coasting on homemade devices is much enjoyed by children, but often accompanied with dangers because of



The Brake Is a Worth-While Addition to the Coaster from the Standpoint of Safety

difficulty in stopping quickly. The sketch shows a method of applying a simple brake to such a coaster, and the materials used may be obtained easily by boys in the home. The rubber mat indicated in the sketch gives a secure footing. The brake consists of a piece of wood, about 10 in. long and 3 in. wide. It is hinged to the base and held in a raised position by a coiled string, attached near the top of the device. A powerful pressure is obtained by throwing the rider's weight on the pedal.

Fountain-Pen Wrench

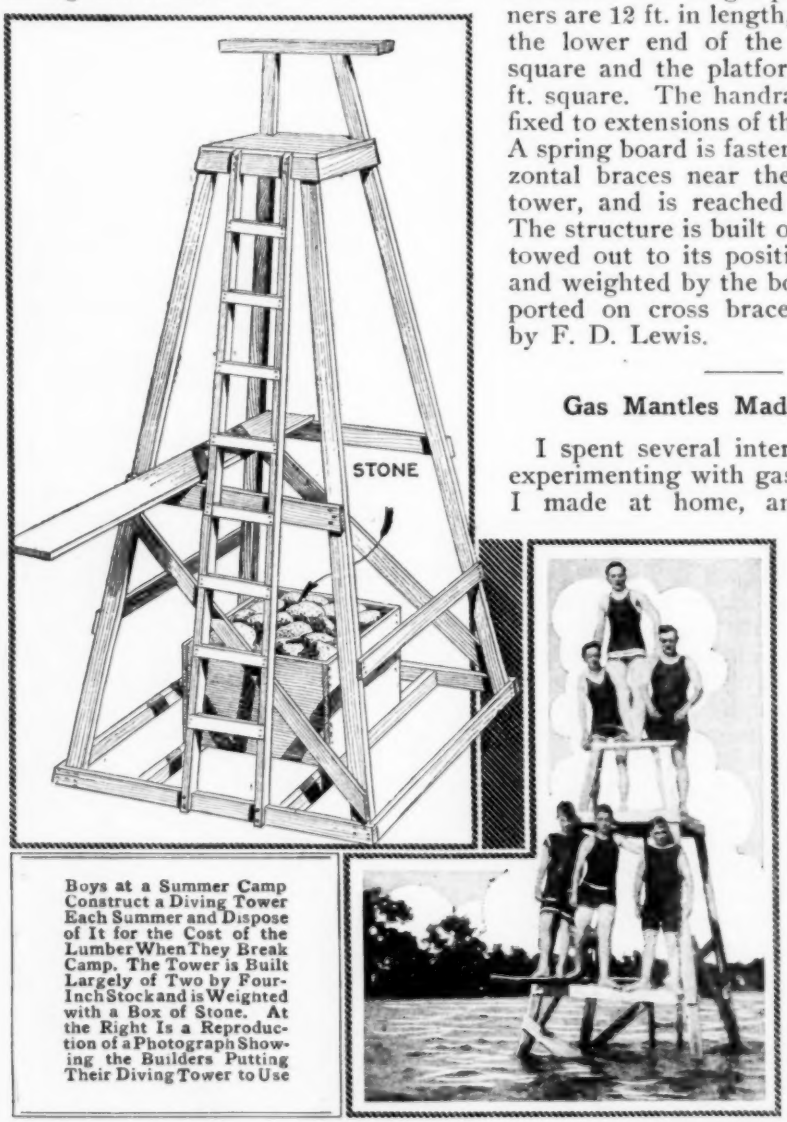
Experiencing considerable difficulty in unfastening the parts of my fountain pen, I pressed into service an eraser in the method illustrated. The grip on the pen parts was positive and resulted in quickly releasing them

The Eraser Aids in Gripping the Barrel

without marring the surface or injuring the fingers.—Contributed by Charles R. Mellen, Jr., Geneva, N. Y.

Diving Tower for the Summer Camp

Aquatic pleasures and sports at a summer camp or lake may be considerably enlivened by the building of a diving tower like that shown in the sketch. It has proved very successful at a boys' summer camp at Crystal Lake, Ill. The boys have made a practice for several years of building a tower early each swimming season on the opening of their camp in July and disposing of it for about $5 at the close of the camp some weeks later. This covers the cost of the lumber, and several resorts and cottages now boast towers made by the campers.



Boys at a Summer Camp Construct a Diving Tower Each Summer and Dispose of It for the Cost of the Lumber When They Break Camp. The Tower is Built Largely of Two by Four-Inch Stock and is Weighted with a Box of Stone. At the Right Is a Reproduction of a Photograph Showing the Builders Putting Their Diving Tower to Use

The tower is built largely of 2 by 4-in. stock. The longer pieces at the corners are 12 ft. in length, slanted so that the lower end of the tower is 7 ft. square and the platform at the top 3 ft. square. The handrail at the top is fixed to extensions of the rear uprights. A spring board is fastened on two horizontal braces near the middle of the tower, and is reached by the ladder. The structure is built on the shore and towed out to its position. It is sunk and weighted by the box of stone supported on cross braces.—Contributed by F. D. Lewis.

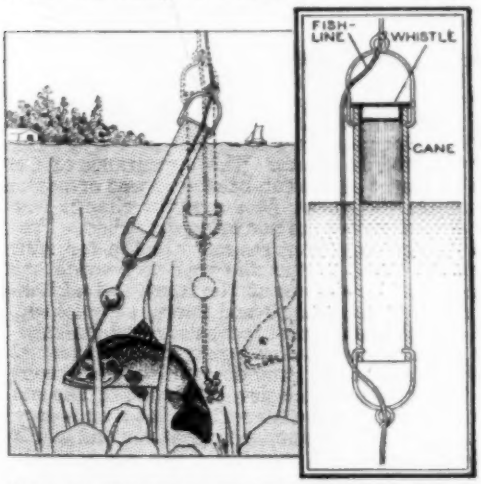
Gas Mantles Made at Home

I spent several interesting hours in experimenting with gas mantles which I made at home, and the process should be of interest to others. While I did not succeed in making mantles of the quality of the commercial article, they were nevertheless successful and gave light. Magnesium produces a white light when ignited. By using common Epsom salts, which contain magnesium sulphate, I made a strong solution in distilled water. I soaked a piece of gauze bandage in the solution, dried it carefully and soaked it again a number of times, drying it after each immersion. By this time the cloth was stiff with the dry salt. When held in a flame, the cloth catches fire and burns

out, leaving the skeleton of magnesium sulphate. This framework, when held in the flame, glows with an intense white light. I shaped a piece of the gauze like a commercial mantle and dipped it into the solution as explained. It proved quite satisfactory.—Contributed by Victor E. Carpenter, South Bend, Ind.

Whistle Warns of Fish Catch

A toy railroad wheel, a piece of hollow cane, and pieces of wire are the materials necessary for making the whistle shown in the illustration, which warns a fisherman that a fish is attempting to make away with his bait. The wheel is fitted into the end of the cane and wedged into place to form a tight joint. The wires are formed into loops at the ends of the cane and fixed to it. The whistle is attached to the fishline, as shown, with the open end down and slightly below the surface of the water. The fishpole may be fixed so that the whistle will remain in this position while the fisherman is at ease in the shade near by. When the fish attempts to make away with the bait, as shown in the sketch,

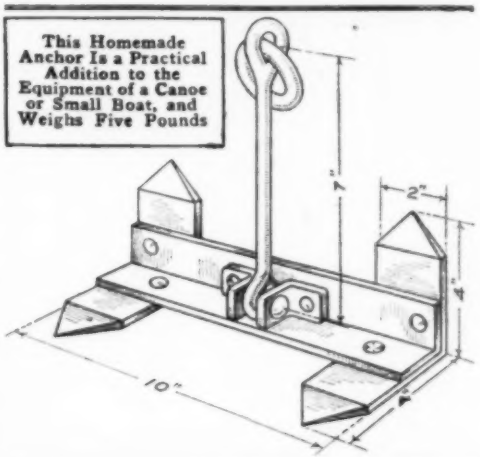


When the Fish Strikes the Bait the Water is Forced Up into the Whistle Suddenly, and the Escaping Air Warns the Fisherman

the water forces the air in the upper part of the cane out through the center hole of the wheel, and a whistling sound is the result.

Anchor for a Canoe or Small Boat

Small craft, particularly those used for fishing or on streams where a current is encountered, should be provided



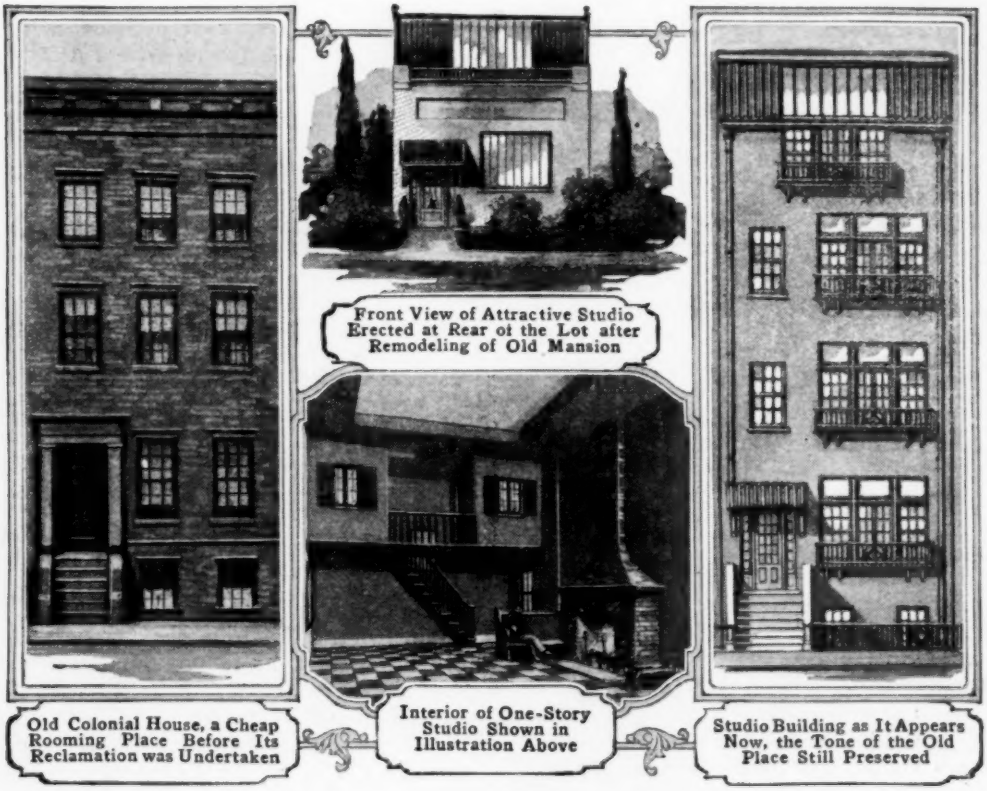
This Homemade Anchor Is a Practical Addition to the Equipment of a Canoe or Small Boat, and Weighs Five Pounds

with an anchor. The illustration gives details for making one that is simple in construction and inexpensive. It weighs about five pounds, and is heavy enough for light craft up to 18 ft. long.

The main section was made of a piece of 1½-in. angle iron, 10 in. long. The flukes, or endpieces, were made of sheet iron, 2 in. wide and 8 in. long, bent at a right angle, and riveted in place. The straps which hold the link, permitting it to swing freely, were made of band iron. The link was made of an old bicycle crank, into which a ring was forged. It may be made of iron rod, forged into the desired shape and fitted with a ring. A convenient method of handling the anchor on a boat is to run the line through a pulley at the bow and fasten the end of it to a cleat, near the seat of the person handling the craft. Care must be taken, in a canoe or small boat, that sufficient line is provided to reach the bottom of the anchorage, as otherwise the craft may be overturned.—Contributed by B. E. Dobree, Battleford, Sask., Canada.

¶The use of gasoline instead of turpentine for a thinner will prevent the sagging of colors in striping.

SIMPLE ALTERATIONS RECLAIM OLD MANSION



Front View of Attractive Studio Erected at Rear of the Lot after Remodeling of Old Mansion

Old Colonial House, a Cheap Rooming Place Before Its Reclamation was Undertaken

Interior of One-Story Studio Shown in Illustration Above

Studio Building as It Appears Now, the Tone of the Old Place Still Preserved

PEPE & BRO., DESIGNERS, NEW YORK

THE services of an architect and an expenditure of a few thousand dollars transformed the old Washington Square mansion, New York City, shown at the left, into the attractive, commodious studio building at the right, and likewise more than quadrupled its earning power. The alterations, although comprehensive, were simple. The brick center pier in the front of the structure was removed so that triple windows, analogous to a studio window 6 by 12 ft., could be provided on each floor and ornamented with iron balconies. The appearance of the front was then improved by applying stucco. The fore part of the sub-basement was arranged to give one large room and a toilet compartment. On the parlor floor a slight change was made to enable the addition of a kitchenette, the general room plan not being disturbed. Partitions on each of the upper floors were removed to give large front rooms. On the top floor the beams were raised about eight feet at the front and three feet at the rear to provide one large studio, a room 21 by 30 ft. in size, having ample window space at the front, and a kitchenette, sun parlor, and bath at the rear. Modern plumbing, hardwood floors, steam heat, electricity, gas, and hot water were provided. The original colonial front door and its trimmings were preserved, the old fireplaces left intact, new ones being constructed on colonial lines only where there formerly had been none, and the aged mahogany doors and silver knobs also were untouched. Throughout, the attempt was made to preserve the tone of the old house, built more than 80 years ago, while modernizing it. At the rear of the lot a one-story studio was also erected. This consists of one large room with a mezzanine floor at one end which carries a kitchenette, bedroom, and bath. Before alterations had progressed far, every studio in the building had been rented without any solicitation by the agents, or even so much as a to-let sign being posted.

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